



PHD

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THE PENETRATION OF EC MARKETS

BY UK MANUFACTURING INDUSTRY

submitted by A.I. Millington
for the degree of Ph.D.
of the University of Bath
1985

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For my Father

SUMMARY

In this study the impact of UK entry into the European Communities on the pattern of manufactured trade between the UK and the original members of the European Communities - EC(6) - is investigated within the context of a disaggregated analysis of the 102 three-digit SITC commodities which form sections five to eight of the SITC.

The analysis is based on two models, the first derived from the traditional theory of customs unions and the second from the theory of intra industry trade.

Whilst the post-entry period has been characterised by a substantial increase in the trade in manufactured goods between the UK and the EC(6), the results provide little support for the traditional theory of customs unions. UK entry does not appear to have resulted in an increase in inter industry specialisation based on the pattern of comparative advantage.

The study confirms the importance of intra industry trade. Intra industry trade accounted for over 70% of the trade in manufactured goods between the UK and the EC(6) in 1970/71 at the three-digit level of classification. During the post-entry period, over 70% of the increase in trade between the UK and the EC(6) has taken the form of intra, rather than inter, industry trade and this has meant that no change has occurred in their relative importance.

The results provide some support for the theory of intra industry trade. The increase in intra industry trade cannot be explained by categorical aggregation. It is positively related to the degree of product differentiation and the height and degree of similarity of UK-EC tariff barriers in the pre-entry period. Finally, the results

suggest that changes in both the proportion and the amount of intra industry trade are positively related to the incidence of non-tariff barriers.

CONTENTS

	Page
Summary	i
Contents	iii
Acknowledgments	v
List of Tables	vi
List of Diagrams	viii
Introduction	1
Part 1 The Impact of UK Entry into the EC on the Pattern of UK Trade. The Theoretical and Empirical Literature	
Chapter 1 The Impact of UK Entry into the EC on UK Trade Flows: The Theory	7
Introduction	7
The traditional theory of customs unions	9
The theory of intra industry trade	20
Conclusion	30
Chapter 2 The Impact of UK Entry into the EC on the Pattern of UK Trade: A Review of the Literature	31
Introduction	31
Aggregate estimates of the impact of EC entry on UK trade flows	32
Disaggregated estimates of the impact of enlargement on UK trade flows	51
Conclusion	65
Part 2 The Penetration of EC(6) Markets by UK Manufacturing Industry: A Test of the Traditional Theory of Customs Unions	
Chapter 3 Import Penetration: The Model	69
Introduction	69
The model	70
The sample	74
Specification and measurement of the dependent variable	77
Specification and measurement of the independent variables	92

	Page
Chapter 4 Import Penetration: The Results	103
Introduction	103
The determinants of the change in the UK share of total imports into the 1 th EC(6) commodity market	103
The determinants of the change in the UK share of total imports into the 1 th EC(6) commodity market from the EC(7)	122
Conclusion	126
Part 3 The Impact of UK Entry into the EC(6) on Intra Industry Trade Between the UK and the EC(6): A Test of the Theory of Intra Industry Trade	
Chapter 5 The Impact of UK Entry into the EC(6) on Intra Industry Trade Between the UK and the EC(6)	127
Introduction	127
The measurement of intra industry trade	130
Aggregate estimates of UK intra industry trade	133
Intra industry trade: the model	145
the dependent variable	147
the independent variables	151
Intra industry trade: the regression results	162
the change in the proportion of intra industry trade	162
the change in the amount of intra industry trade	171
Conclusion	179
Conclusion	182
Appendix 1	190
Appendix 2	197
Bibliography	204

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List of Tables

Table		Page
2.1	Ratio of Actual Growth of UK Exports of Manufactures to Exports at Constant Market Shares	36
2.2	Conditional Estimates of the EEC Effect on UK Manufacturing Trade on Intermediate Elasticity Assumptions	44
2.3	Median Tonne Values of Exports	47
2.4	Estimates of the Effect of EC Enlargement on the UK Balance of Trade in Manufactured Goods	49
2.5	Representative Ratios of Trade Balances	58
2.6	Average Levels of UK Intra Industry Trade, 1977	62
3.1	The Timing of Mutual Tariff Dismantling	72
3.2	Annual Changes in GDP, 1970-1981	73
3.3	The Impact on UK Trade Flows of the Method of Estimation	76
3.4	The Price Index	77
3.5	Manufactured Imports into the EC(6) and the RW3 in 1970	84
4.1	Regression Analysis: the Determinants of the Change in the UK Share of Total Imports into the 1 th EC(6) Commodity Market	104
4.2	Revealed Comparative Advantage. Zero Order Correlation Matrix	106
4.3	The Rate of Growth of EC Import Markets and the Import Share of the UK	109
4.4	The Rate of Growth of EC Import Markets and the Import Share of the UK	110
4.5	Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Total Imports into the 1 th EC(6) Commodity Market	113
4.6	The Commodity Groups in Which the UK Share of Total Imports into the 1 th EC(6) Market has Grown Fastest and Slowest	116

Table		Page
4.7	Regression Analysis: the Determinants of the Change in the UK Share of Total Imports into the i th EC(6) Commodity Market	119
4.8	Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Total Imports into the i th EC(6) Commodity Market	119
4.9	Regression Analysis: the Determinants of the Change in the UK Share of Imports from the EC(7) into the EC(6) Commodity Market	123
4.10	Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Imports from the EC(7) into the EC(6) Commodity Market	124
5.1	The Proportion of Intra Industry Trade in Total UK Trade in Manufactures	135
5.2	The UK's Balance of Trade in Manufactures, 1970/71 and 1978/79	137
5.3	Corrected Estimates of the Proportion of Intra Industry Trade in Total UK Manufactured Trade	139
5.4	The Change in Intra Industry Trade as a Percentage of the Change in Total Trade	141
5.5	The Percentage Change in Total and Intra Industry Trade in Manufactured Goods Between 1970/71 and 1978/79	143
5.6	Regression Estimates of the Determinants of the Proportion of Intra Industry Trade in 1978/79	163
5.7	Intra Industry Trade Zero Order Correlation Matrix	164
5.8	Regression Estimates of the Determinants of the Adjusted Proportion of Intra Industry Trade in 1978/79	168
5.9	Regression Estimates of the Determinants of the Change in the Amount of Intra Industry Trade Between 1970/71 and 1978/79	172
5.10	Regression Estimates of the Determinants of the Adjusted Change in the Amount of Intra Industry Trade Between 1970/71 and 1978/79	175

List of Diagrams

Diagram		Page
1.1	The Consumption and Production Effects with Perfectly Elastic Import Supply Curves	11
1.2	The Consumption and Production Effects with a Positive Import Supply Elasticity $e > 0 < \infty$	13
1.3	Export Trade Diversion	14
1.4	The Impact of a Change in Tariffs on the Trade in Differentiated Goods	24
4.1	The Relationship Between the Change in the UK Share of Total Imports into the 1 th EC(6) Market (PIEC) and the UK Trade Balance with the EC(6) in 1970/71 (RCEC).	117

INTRODUCTION

In this study the impact of UK entry into the European Communities (EC) on the pattern of manufactured trade between the UK and the six original member states - France, West Germany, the Netherlands, Belgium, Italy and Luxembourg - (EC(6)) is investigated, within the context of a disaggregated analysis of the 102 three-digit SITC (Standard International Trade Classification) manufactured commodities which form sections five-eight of the SITC.

According to the traditional theory of customs unions, UK entry into the EC should have resulted in an increase in inter industry trade and specialisation between the UK and the EC(6), in line with the pattern of comparative advantage¹.

However, earlier studies of the formation of the EC and the first enlargement cast doubt on these predictions. Thus Sazanami and Hamuguchi², Hufbauer and Chilas³ and Grubel and Lloyd⁴ suggest that whilst the formation of the EC did result in an increase in intra EC(6) trade, it took the form of an increase in intra industry trade rather than an increase in inter industry specialisation.

1 See chapter 1, p.30.

2 Sazanami, Y. and Hamuguchi, N. 'Intra-Industry Trade in the EEC, 1962-1972', Keio Economic Studies, Vol. XV, pt 2, 1978, pp.53-68.

3 Hufbauer, G. and Chilas, J.C. 'Specialization by Industrial Countries: Extent and Consequences' in Giersch, H. (ed.) The International Division of Labour: Problems and Perspectives, International Symposium, Tübingen, 1974, pp.3-38.

4 Grubel, H.G. and Lloyd, P.J. Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Macmillan, 1975.

Kreinen⁵ has suggested that the proportion of intra industry trade in manufactured trade between the European members of the OECD continued to increase between 1970 and 1976. Similarly, results generated in this study suggest that whilst the total trade in manufactured goods between the UK and the EC(6) increased substantially between 1970/71 and 1978/79, 76% of this increase was accounted for by intra industry, rather than inter industry, trade⁶.

In the light of these findings the impact of UK entry into the EC on the pattern of UK trade with the EC(6) is investigated within the framework of a set of hypotheses derived from the traditional theory of customs unions and the theory of intra industry trade.

The analysis focuses on two questions:

1. To what extent can inter industry differences in the change in the penetration of the ith EC(6) import market by UK manufacturing industry since UK entry into the EC, be explained by the traditional theory of customs unions?
2. To what extent can the change in the pattern of UK trade with the EC(6) in manufacturing goods since UK entry into the EC, be explained by the theory of intra industry trade?

Whilst the impact of EC entry on the pattern of UK trade has been investigated in a number of earlier studies, most of these studies have estimated the impact of UK entry into the EC on UK

5 Kreinen, M.E. 'Static Effects of EC Enlargement on Trade Flows in Manufactured Products', Kyklos, Vol. 34, 1981, pp.60-71.

6 See chapter 5, p. 141.

export and import flows at the sectoral level⁷, or for UK manufacturing industry as a whole⁸. In contrast, in this study the impact of UK entry into the EC on the pattern of inter and intra industry trade and specialisation between the UK and the EC(6) is investigated at the industry level.

Owen⁹ has investigated the pattern of trade between the UK and EC(6) at the three-digit level of the SIC (Standard Industrial Classification), but this study was limited to the period 1970-75. In addition Owen sought to explain inter industry differences in the trade balance, whereas in this study inter industry differences in the change in penetration of EC(6) import markets and the proportion and amount of intra industry trade form the focus of the analysis.

The thesis is divided into three parts. Part I provides a theoretical and historical framework, within which the change in the pattern of UK trade with the EC(6) is investigated, in Parts II and III. Part I is divided into two chapters.

In chapter 1 the impact of UK entry into the EC on the pattern of inter and intra industry specialisation in manufactured trade between the UK and the EC(6) is analysed, within the context of the traditional theory of customs unions and the theory of inter industry trade. The predictions generated in this chapter form the basis of

7 See for example Daly, A.E. 'UK Visible Trade and the Common Market', National Institute Economic Review, Vol. 86, November 1978, pp.42-54.

8 See: Fetherston, M., Moore, B. and Rhodes, J. 'EEC Membership and UK Trade in Manufactures', Cambridge Journal of Economics, 1979, Vol. 3, pp.399-407; Morgan, A.D. 'The Balance of Payments and British Membership of the European Community' in Wallace, H. (Ed.) Britain in Europe, Heineman, 1980; Winters, L.A. 'Britain's Trade Patterns Since Joining the Common Market', British Review of Economic Issues, forthcoming.

9 Owen, N. 'Britain's Pattern of Specialisation', unpublished Department of Trade Working Paper, ref. LTWG. (77).18., 1977.

the econometric models developed and tested in Parts II and III.

Chapter 2 contains a critical review of the ex post studies of the impact of UK entry into the EC on the pattern of trade between the UK and the EC(6). The aggregate estimates of the impact of UK entry on the trade in manufactured goods between the UK and the EC(6) are discussed in the first section. The sectoral estimates and the growth of intra industry trade are then discussed in the second half of the chapter. The chapter highlights the problems of specification and measurement which must be overcome before satisfactory estimates of the impact of UK entry into the EC on the pattern of inter and intra industry trade and specialisation can be estimated.

In Part II, the change in the penetration of EC(6) markets by UK manufacturing industry is analysed in the context of a model derived from the traditional theory of customs unions outlined in chapter 1. Inter industry differences in the change in penetration are explained in terms of a set of variables which includes revealed comparative advantage and the height of EC(6) tariff and non-tariff barriers. The estimated model is developed and discussed in chapter 3. The results are then presented and discussed in chapter 4.

The impact of UK entry into the EC on the amount and proportion of intra industry trade between the UK and the EC(6) is investigated in Part III. Part III is divided into four sections. The measurement of intra industry trade is discussed in the first section. The impact of UK entry on the proportion and amount of intra industry trade in the total trade in manufactured goods between the UK and the EC(6) is then discussed in section 2. An attempt is then made to explain inter industry differences in the change in the amount

and proportion of intra industry trade between the UK and the EC(6) after UK entry into the EC. The estimated model is developed and discussed in section 3. The model is based on the theory of intra industry trade outlined in chapter 1. The results are then presented and discussed in section 4.

PART 1

**The Impact of UK Entry into the EC
on the Pattern of UK Trade: The
Theoretical and Empirical Literature**

CHAPTER 1

The Impact of UK Entry into the EC on UK Trade Flows: The TheoryIntroduction

Following the publication of Jacob Viner's¹ seminal contribution to customs union theory, 'The Customs Union Issue', a substantial body of literature investigating both the impact on trade flows and the welfare implications of customs unions has developed. This body of literature predicts that the formation of a customs union will result, inter alia, in an increase in inter industry specialisation within the customs union based on the pattern of comparative advantage.

However, recent studies by Sazanami and Hamuguchi², Grubel and Lloyd³ and Balassa⁴ suggest that whilst the formation of the EC did result in an increase in intra EC trade, it took the form of an increase in intra industry trade rather than an increase in inter industry specialisation.

To some extent this finding may reflect the inadequacy of the data: the absence of a firm link between the theoretical concept of the industry and the empirical construct which forms the basis of the analysis. Thus the theoretical concept refers to the production of goods which have identical factor proportions, whilst the empirical construct may contain goods which have different factor

1 Viner, J. The Customs Union Issue, New York, Carnegie Endowment for International Peace, 1950.

2 Sazanami, Y. and Hamuguchi, N. 'Intra-Industry Trade in the EEC, 1962-1972', Keio Economic Studies, Vol. XV, pt 2, 1978, pp.53-68.

3 Grubel, H.G. and Lloyd, P.J. Intra Industry Trade, Macmillan, 1975.

4 Balassa, B. 'Tariff Reductions and Trade in Manufactures Among the Industrialized Countries', American Economic Review, Vol. 56, 1966, pp.466-478.

intensities. These estimation problems may, therefore, offer a partial explanation of the observed absence of inter industry specialisation⁵.

Two other explanations of the growth in intra industry trade and the absence of inter industry specialisation have been proposed. The first explanation can be accommodated within the general framework of traditional customs union theory. Hufbauer and Chilas⁶ have suggested that the presence of balanced trade and the absence of any increase in inter industry specialisation, within the EC, may be explained by the reluctance of the member states to permit inter industry specialisation in Heckscher-Ohlin industries. They hypothesise that this objective has been achieved through the imposition and maintenance of internal non-tariff barriers and the reciprocal nature of non-tariff concessions. According to traditional customs union theory, the degree of inter industry specialisation will be inversely related to the height of non-tariff barriers⁷.

The second explanation is based on the theory of intra industry trade. The growth of intra industry trade and specialisation is explained in terms of a set of industry and country hypotheses which can be derived by relaxing the assumptions which underlie the Heckscher-Ohlin model. The theory emphasises the role of product

5 For a detailed discussion of this point see Gray, P.H. 'Intra-Industry Trade: The Effects of Different Levels of Data Aggregation' in Giersch, H. (ed.) On the Economics of Intra-Industry Trade: Symposium, Tübingen, 1978, and Finger, J.M. 'Trade Overlap and Intra-Industry Trade', Economic Inquiry, Vol. 13, Long Beach, 1975, pp.581-89.

6 Hufbauer, G. and Chilas, J.C. 'Specialisation by Industrial Countries: Extent and Consequences' in Giersch, H. (ed.) The International Division of Labour: Problems and Perspectives, International Symposium, Tübingen, 1974, pp.3-38.

7 See p.12.

differentiation and economies of batch and long-run production as determinants of manufactured trade between the industrial countries⁸.

In this chapter the predictions of traditional customs union and intra industry trade theory are reviewed and contrasted, with respect to the impact of the formation of a customs union on trade flows. Particular attention will be paid to the implications of the theory for the analysis of the impact of EC enlargement on UK trade flows.

Traditional customs union theory is reviewed in section I. Section II contains a discussion of intra industry trade theory and its implications for the development of trade flows within a customs union. The predictions of customs union and intra industry trade theory, for the development of UK-EC(6) trade flows during the post-enlargement period, are then contrasted and discussed in the concluding section.

Section I - The traditional theory of customs unions

Traditional customs union theory is primarily concerned with the estimation of the welfare effects of the formation of a customs union. This study, however, is concerned not with the estimation of the welfare effects of enlargement, but rather with the impact of UK entry into the EC on the pattern of UK trade. For this reason there is a concentration on the implications of customs union theory for the pattern of trade and production.

According to Viner⁹ the static effects of the formation of a

⁸ See pp. 20-29.

⁹ Viner, op. cit.

customs union on the pattern of trade can be divided into two components, trade creation and trade diversion. Trade creation occurs as lower cost imports, from partner countries, are substituted for higher cost domestic production after the removal of intra union tariffs. This results in goods and services being produced in the lowest cost centres of production within the customs union as each of the partners specialises in its area of comparative advantage, based on relative factor endowments.

Trade diversion represents a shift in the locus of production, from a lower cost country outside the customs union to a higher cost country within the customs union. This shift arises as a consequence of the fall in the selling price of goods produced by partner countries, relative to non-member countries, after the removal of intra union tariffs, whilst a common external tariff is created or maintained.

These concepts were subsequently extended by Meade¹⁰ who pointed out that Viner¹¹ had implicitly assumed that the elasticity of demand for imports in the home market was equal to zero. If this assumption is relaxed, formation of a customs union will result in both a change in the source of supply, the production effect, and an increase in demand for the product as price falls, the consumption effect¹².

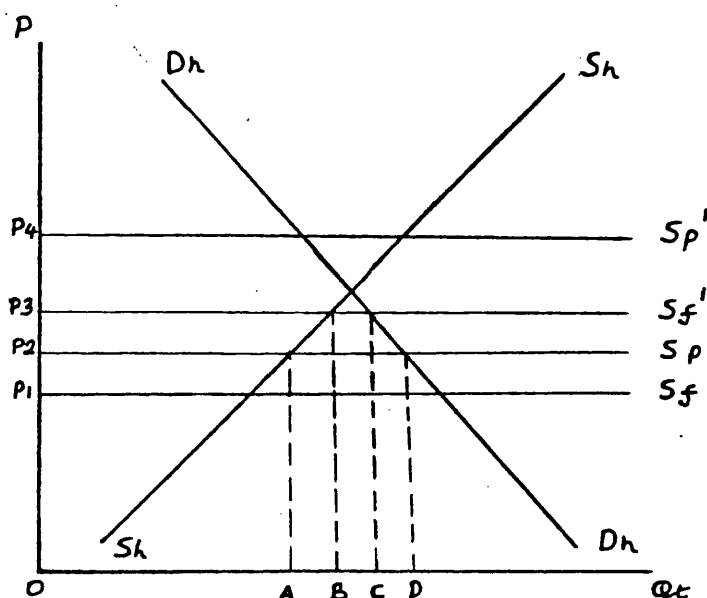
10 Meade, J.E. The Theory of Customs Unions, Amsterdam, North Holland, 1955.

11 Viner, op. cit.

12 See Johnson, H.G. 'Discriminatory Tariff Reductions: A Marshallian Analysis', Indian Journal of Economics, Vol. XXXVIII, July 1957, pp.39-47, and Lipsey, R.G. 'The Theory of Customs Unions: Trade Diversion and Welfare', Economica, Vol. XXIV, No. 93, February 1957, pp.40-46, for a detailed discussion of this point.

These effects are illustrated in diagrams 1.1 and 1.2. In diagram 1.1¹³ the import supply curves are assumed to be perfectly elastic. This assumption may be realistic if the home market is small relative to the partner and the foreign countries, since the increase in demand will be small relative to the total output of the countries supplying the imports. In diagram 1.2¹⁴ this assumption is relaxed and a case which may be analogous to UK performance in the EC(6), since the first enlargement, is analysed.

Diagram 1.1



In diagram 1.1 D_h and S_h represent domestic demand and supply for a given product. S_p is the import supply curve of the future partner, S_f the import supply curve of the non-member country, and

13 The diagram is adapted from Ergler, M.J. An Analysis of Trade Creation and Trade Diversion through the Estimation of Import Demand Functions: The European Economic Community, unpublished Ph.D. thesis, University of North Carolina, 1975, p.10.

14 The diagram is adapted from Ergler, op. cit, p.13.

S_f^1 and S_p^1 the import supply curves of the non-member and potential partner countries inclusive of a tariff.

Before the formation of the union, a price P_3 is charged in the market. This results in a total demand of OC of which OB is supplied by domestic producers and BC by the non-member country. The potential partner is unable to compete at the prevailing price and supplies nothing.

After the formation of the customs union the price falls to P_2 , the partner supply price after the removal of the tariff. Demand then increases to OD, of which AD will be supplied by the partner country and OA by domestic production. The foreign country is unable to compete at the price P_2 and supplies nothing.

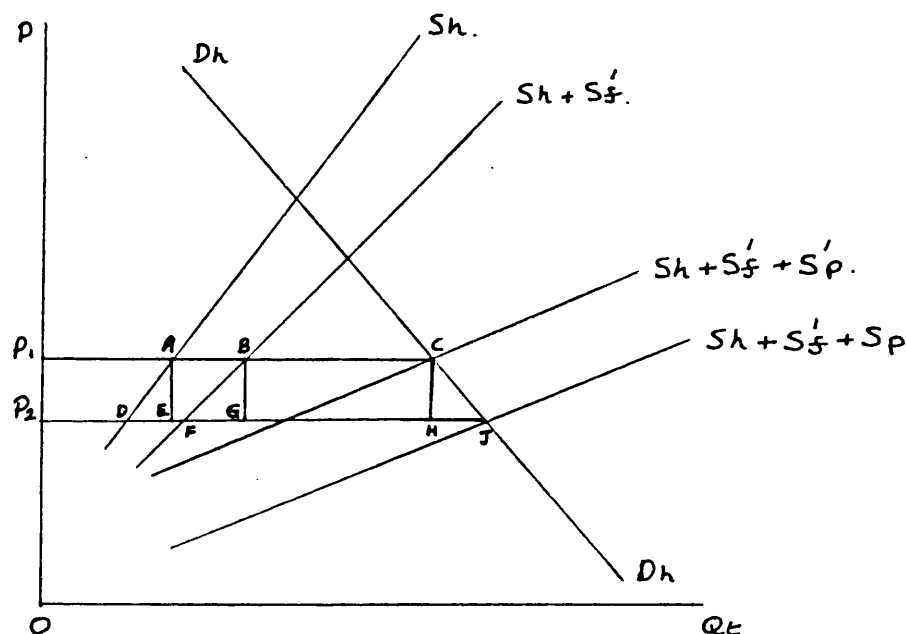
The increase in intra union trade can be divided into three components: AB which represents the substitution of lower cost imports from the partner country for domestic production (trade creation); BC, the expansion in intra union trade which occurs because higher cost partner imports are substituted for lower cost non-member country imports (trade diversion); and CD, the increase in partner imports required to supply the expanded demand at the lower market price (consumption effect).

Each of the partners will specialise in the commodities in which they have a comparative advantage. The possibilities for specialisation will be greater the higher are the initial tariffs, the more similar are the product ranges produced by the potential partners, and the greater are the differences in the relative prices at which they produce them. The potential for specialisation will be constrained by the height of non-tariff barriers and transportation costs. The ability of the partners to take advantage of the

potential for specialisation will also be dependent upon the partners' import supply elasticities.

Diagram 1.2 shows the case where the assumption of perfectly elastic import supply curves is relaxed. The notation is the same as in diagram 1.1.

Diagram 1.2



At the pre-union price P_1 , P_1A is supplied by domestic producers, AB is imported from the non-member country and BC is imported from the partner country. Formation of the customs union will shift the aggregate supply curve to $S_h + S'_f + S_p$. Price will fall to P_2 , the domestic share falls to P_2D , imports from the non-member country decline to DE and the partner's share rises to FJ .

The increase in the partner's share consists of three components: DE , the substitution of domestic production by partner imports (trade creation); FG minus DE , the substitution of partner imports for imports from non-member countries (trade diversion); and HJ ,

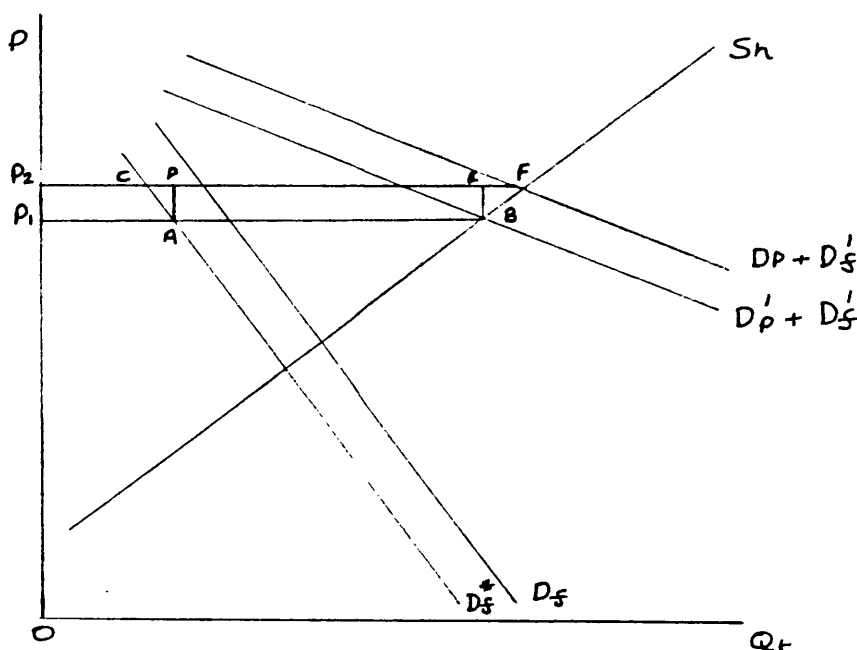
the increase in partner imports which arises because of the fall in price (consumption effect).

The introduction of a positive supply elasticity has two implications. First, domestic producers, partner countries and non-member countries may have some share of the market, both before and after formation. Second, the magnitude of the increase in intra union trade will depend on the import supply elasticity of the partner country. Thus, if the import supply elasticity is highly inelastic, creation of the union will result in a relatively small increase in imports from the partner, and limited trade creation and diversion.

The import supply elasticity of partner country imports to the home country will be a function of the size of the home market relative to the partner, the flexibility of total supply and the potential for export trade diversion.

The relationship between the partner's import supply elasticity and trade in non-member countries is shown in diagram 1.3¹⁵.

Diagram 1.3



15 The diagram is adapted from Johnson, op. cit., p.71.

Sh represents the home country's export supply curve; Df is the foreign country's demand curve for imports; $Dp^1 + Df^1$ represents the total demand for home country exports before the formation of the union; $Dp + Df^1$ shows the sum of the foreign and partner country demand for home country exports after the reduction in intra union tariffs.

In the pre-union period a price P_1 is charged and the home country exports an amount P_1B , of which P_1A is sold in the foreign country and AB is sold in the partner country. After the reduction in intra union tariffs demand rises to $Dp + Df^1$, resulting in an increase in price to P_2 . At this price P_2F is supplied by the home country, of which P_2C is exported to the foreign country and CF is exported to the partner country. In effect exports to the foreign country have fallen by CP (export trade diversion). Clearly the lower the export supply elasticity of the home country, the larger will be the export trade diversion effect.

This tendency may be exacerbated by the impact of the terms of trade on the trading capacity of the foreign country. As a consequence of trade diversion in the partner markets the foreign country will sell less of her products in the customs union. This will reduce the foreign country's ability to buy the partner's exports and will shift the foreign demand curve for partner country exports to D^*f . The smaller the foreign country and the larger the percentage of foreign exports sold in the customs union, the larger will be the shift in D^*f . The effect will be to further reduce partner sales in the foreign market.

In addition to the static effects of the formation, or enlargement, of a customs union on the pattern of trade, a number of dynamic

effects can also be isolated. In the first case the reduction in barriers to entry may result in an increase in competition in national markets which were oligopolistic in the pre-entry situation. This may have the effect of reducing the degree of X inefficiency in those markets. Thus integration will result not only in the location of production in the most efficient centres of production but may also reduce X inefficiency and cut costs. However, this decline in X inefficiency may only occur in the short-run. In the long-run customs union-wide oligopolies or monopolies may develop within markets protected by the Common External Tariff. This may lead to the reappearance of X inefficiency in larger or smaller quantities than in the pre-integration situation.

The fall in the height of barriers to entry and the expansion of the market will also enable firms to take advantage of available firm, or plant, economies of scale. This will result in a fall in costs and a welfare gain, if the costs of production are lower within the customs union than in the rest of the world.

Finally, the expansion in market size will increase the opportunities for successful invention and innovation. This will result in an increase in the average growth rates of the member states.

Implications of the analysis for the impact of UK entry into the EC on UK trade flows. The static effects of UK entry into the EC on UK manufacturing industry, can be split into three components: the change in the UK's share of the UK's domestic market, the change in UK exports to the EC(6) and the change in UK exports to the rest of the world.

The UK's share of the domestic market would be expected to fall,

as a consequence of inter industry specialisation and trade creation. The size of the decline in the UK's share will be determined by the height of UK tariffs in the pre-entry period, the export supply elasticity of the EC, and the potential for inter industry specialisation.

An increase in UK exports to the EC(6) can be predicted as a consequence of both trade creation, where a consumption and a production effect can be identified, and trade diversion. The size of this increase will depend on the height of EC tariffs in the pre-entry period, the height of the common external tariff after EC entry, the export supply elasticity of the UK, and the potential for inter industry specialisation.

The potential for inter industry specialisation, and hence trade creation, will be higher the more similar the range of goods produced by the potential partners, and the greater the divergence in factor endowments. Whilst the UK and the EC(6) produce a similar range of products, the degree of similarity in factor endowments may limit the development of inter industry specialisation.

The export supply elasticity will be determined by the size of the market of the potential partner, relative to the industry of the home country. The elasticity will be high if the partner market is small relative to the size of the home country. In this case the export supply elasticity of the EC(6) to the UK market may be higher than the export supply elasticity of the UK to the EC(6) market. This implies that the EC(6) may be better placed to take full advantage of the decline in tariff barriers.

If the export supply elasticity of the UK is less than infinite, UK exports to the rest of the world may fall as a consequence of

export trade diversion. In effect UK exports will be redirected to a potentially more profitable market.

The performance of UK manufacturing industry in the EC after entry will also be affected by changes in the terms of trade of the UK, the EC(6) and the rest of the world. Thus UK exports to the rest of the world may decline if the terms of trade move against the rest of the world and hence demand falls. Similarly the increase in UK exports to the EC(6) will be constrained if the terms of trade move against the rest of the world, since the price of imports from the rest of the world will fall relative to those from the UK. In this case the opportunities for trade diversion may decline.

Thus the net effect of UK entry into the EC on the UK's manufacturing industry will be equal to the sum of the fall in the UK share of the UK domestic market, the increase in UK exports to the EC(6) and the fall in UK exports to the world.

The change in the pattern of specialisation, in manufactured trade between the UK and the EC(6), and the performance of different UK manufacturing industries within the EC(6), will be determined by the relative height of tariff and non-tariff barriers, the pattern of comparative advantage, the price elasticity of demand and the import supply elasticity of the i^{th} industry. The impact of UK entry into the EC on the export performance of the i^{th} UK industry in the EC(6) will be positively related to the height of the EC tariff in the pre-entry period, the height of the common external tariff after entry, and the price elasticity of demand and import supply elasticities of the i^{th} industry. It will be negatively related to the height of non-tariff barriers between the UK and the EC(6).

The dynamic implications of entry into the EC for UK manufac-

turing industry have been extensively analysed by Lipsey¹⁶ and Johnson¹⁷. They have suggested that the increase in efficiency and growth, which result from increased competition and the expansion of the market, would represent the most important products of an expanded EC for UK manufacturing industry. However, the implications of the dynamic effects of integration for the change in the pattern of UK trade and specialisation after enlargement, are unclear.

If we assume that the products produced within an industry are homogeneous, the existence of plant or firm level economies of scale may reinforce the trend towards specialisation based on factor costs, or result in a different pattern of specialisation. Economies of scale will reinforce the trend towards specialisation, based on factor costs, if those firms which possess a factor cost advantage are also able to reap economies of scale or if economies of scale are equally available to all firms at the point of enlargement. In the second case the pattern of specialisation will not be determined by factor costs but rather by the size of the partner markets, and hence the ability of firms and industries to reap economies of scale in the pre-entry period.

Johnson¹⁸ has argued that the domestic markets of the UK and most of the Western European countries were already sufficiently large for firms to take advantage of any available economies of scale. This implied that inter industry specialisation, after enlargement, would be determined by factor costs rather than by

16 Lipsey, R.G. 'The Theory of Customs Unions: A General Survey', Economic Journal, Vol. LXX, No. 279, September 1960, pp.496-513.

17 Johnson, H.G. 'The Economic Gains from Free Trade with Europe', Three Banks Review, September 1958, pp. 3-19.

18 Johnson, 1958, op. cit.

economies of scale. The empirical basis for this argument is, however, open to question. Thus the minimum efficient scale for the production of electronic calculators, turbo generators, TV tubes and aircraft is larger than total UK production of these commodities¹⁹. Similarly, the minimum efficient scale for the production of industrial diesels, electric motors and refrigerators exceeds 50% of total UK production of these commodities²⁰.

This analysis ignores the possibility of economies of batch and long production runs in industries which are characterised by monopolistic competition. This case is extensively analysed in the next section.

Section II - The theory of intra industry trade

In this section the theory of intra industry trade is outlined and discussed in the context of UK entry into the EC. Following Grubel²¹, the industry hypotheses can be divided into two groups: theories of trade in functionally homogeneous goods differentiated by time and location, and theories of trade in functionally differentiated goods. Both sets of theories are derived by relaxing one or more of the assumptions which underlie the Heckscher-Ohlin model.

19 Pratten, C.F. Economies of Scale in Manufacturing Industry, University of Cambridge Department of Applied Economics Occasional Paper 28, Cambridge, Cambridge University Press, 1971.

20 Ibid.

21 Grubel, H.G. 'Intra-Industry Specialisation and the Pattern of Trade', Canadian Journal of Economics and Political Science, Vol. 33, August 1967, pp.374-88.

Trade in functionally homogeneous goods. Intra industry trade may take place in functionally homogeneous goods which are differentiated by location (border trade), by time (seasonal products) or in services which are sold with a product (insurance, banking services). The last two cases are of little relevance to the analysis of intra industry trade in manufactured goods and will not, therefore, be discussed here. The first case forms the basis of the discussion.

The Heckscher-Ohlin model makes the assumption that there are zero transport and distribution costs. If this assumption is relaxed, consumers will purchase from the lowest cost supplier inclusive of transport and distribution costs. Intra industry trade will result if the costs of distribution and transport from the nearest home supplier are higher than the costs of transport, distribution, tariff and non-tariff barriers from a supplier located in a neighbouring country²².

The magnitude of this trade will be positively related to transport and distribution costs, and negatively related to the height of tariff and non-tariff barriers.

The formation of a customs union would be expected to result in an increase in intra industry trade in functionally homogeneous goods which are differentiated by transport and distribution costs. Both a short-run effect, as consumers switch sources of supply, and a long-run effect, as firms relocate to take advantage of the new market structure, would be expected. The size of the increase in intra industry trade would be a function of the height of tariffs in the pre-formation periods, transport costs and non-tariff barriers.

22 For a detailed discussion of this point see Grubel and Lloyd, op. cit., pp.73-77.

The importance of this source of intra industry trade, in the case of UK entry into the EC, is probably limited. Transport and distribution costs form a small proportion of the value of net output of manufactured commodities²³. Whilst some commodities with substantial transport costs are included in the analysis, these commodities account for a small proportion of the total trade in manufactured goods²⁴. In addition, the Channel forms a considerable geographical barrier to trade, which may preclude or substantially reduce the potential for intra industry trade in functionally homogeneous goods which are differentiated by location.

Functionally differentiated goods. The second strand of intra industry trade theory is concerned with trade in similar products which are differentiated by design or quality, and which perform the same end function. The goods are close substitutes with downward sloping demand curves in national markets which are characterised by monopolistic competition.

The impact of a tariff change on trade in differentiated goods can be considered within the context of a model originally developed by Grubel²⁵. Grubel analysed the impact of a cut in tariffs on trade in differentiated products within a partial equilibrium framework.

Two countries are considered: country I, the home country, and country II, the rest of the world. The industry contains a large

23 See Edwards, S.L. 'Transport Costs in British Industry', Journal of Transport Economics and Policy, September 1970, pp.265-278.

24 According to Edwards, op. cit., transport costs account for over 15% of the value of net output in the case of only one manufactured commodity (SITC 5-8) - coke ovens.

25 Grubel, op. cit.

number of firms, each of which produces a range of products which are differentiated by quality. The qualities are produced at different costs, and the marginal cost curves are assumed to be perfectly elastic.

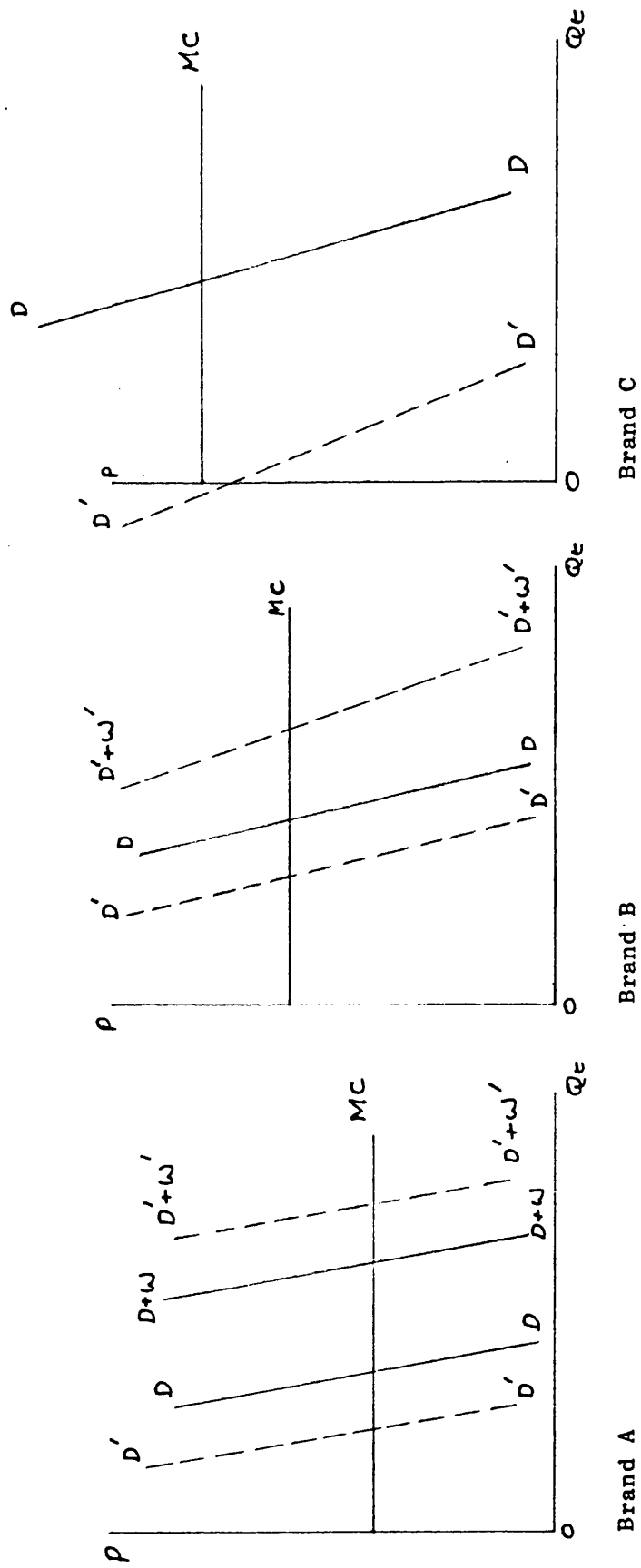
The marginal revenue and cost curves for three brands produced by a firm in a given industry in country I are shown in diagram 1.4. D and D^1 represent the firm's domestic marginal revenue curves in the pre-entry and post-entry positions respectively. W and W^1 represent the firm's marginal revenue curves in country II in the pre-entry and post-entry positions respectively. MC shows the marginal cost of producing the three different qualities.

During the pre-entry period product A is both imported and exported, while products B and C are only sold in the home market. If the tariff barriers are removed, the domestic marginal revenue curves shift to the left as close substitutes for each of the brands enter the market. At the same time the country will increase its sales of brand A and brand B in the foreign market. After the increase in competition the company is unable to produce brand C profitably. The end result is an increase in intra industry trade as the home country specialises in brand A and brand B.

The degree of intra industry trade will, therefore, depend on the price elasticity of demand for the products and the height of tariff and non-tariff barriers to trade between the countries. A cut in tariff or non-tariff barriers will result in an increase in intra industry trade²⁶.

²⁶ Whilst the theory suggests that there will be an increase in intra industry trade, it does not distinguish between an increase in the amount of intra industry trade and an increase in the proportion of intra industry trade in total trade. This point is extensively discussed in chapter 5, pp. 151-53.

Diagram 1.4



The analysis raises two questions. Firstly, why do the countries not produce the full range of brands? Secondly, what factors underlie and determine the pattern of intra industry specialisation?

The inability of countries to produce the full range of brands can be explained by four distinct hypotheses. Each of these explanations is based on the failure of the importing country to produce the imported good without incurring an absolute cost disadvantage.

1. Differences in factor inputs. If the different brands require different factor inputs, and the factor inputs have different prices in the two countries, the incidence of intra industry trade and the pattern of specialisation can be explained by the theory of comparative advantage²⁷. Thus a country which is rich in human capital might be expected to produce higher quality brands with a large human capital input. This would not, however, constitute intra industry trade in the pure sense, since in this case products classified within the same industry have different factor intensities²⁸.

2. Brand loyalty. The imported good may be differentiated from home produced commodities by advertising and trademarks. To the extent that advertising has a stock as well as a flow component, the home producer will have an absolute cost

27 See Falvey, R.E. 'Commercial Policy and Intra Industry Trade', Journal of International Economics, Vol. 11, 1981, pp.495-511, for the derivation of a formal model of intra industry trade based on differences in quality and relative factor abundance.

28 The problems of industry definition lie at the centre of the intra industry trade debate. These problems are discussed in Gray, H.P. 'Intra-Industry Trade: The Effects of Different Levels of Data Aggregation', in Giersch (ed.) On the Economics of Intra Industry Trade: Symposium, Tübingen, 1979, and in chapter 2, pp.60-63.

disadvantage²⁹. Caves³⁰ has argued that differentiation based on advertising is relatively unimportant, since advertising tends to be country specific.

3. Economies of batch and long-run production. The imported good may possess an absolute cost advantage if the exporter is able to take advantage of economies of batch or long-run production.

The removal of tariff barriers will reduce barriers to entry and effectively enlarge the potential market available to producers. This will provide opportunities for firms to increase the length of production runs, resulting in a fall in unit costs as a result of specialisation, smaller inventories and a reduction in setting-up time. Removal of the tariff will reinforce the advantage that a product with a long production run already has, and result in a further cut in unit costs as the length of production runs increases³¹.

This implies that an increase in intra industry trade will result from a cut in tariffs, with each country specialising in a different range of products. Both a production effect, as production is located in the most efficient

29 For a discussion of advertising as a barrier to entry, see Cowling, K. and Waterson, M. 'Price Cost Margins and Market Structure', Economica, Vol. 43, August 1976, pp.267-74.

30 Caves, R.E. 'Intra-Industry Trade and Market Structure in the Industrial Countries', Oxford Economic Papers, Vol. 33, pp.203-23.

31 Both Krugman, P. 'Increasing Returns, Monopolistic Competition and International Trade', Journal of International Economics, Vol. 9, 1979, pp.469-79, and Lancaster, K. 'Intra-Industry Trade Under Perfect Monopolistic Competition', Journal of International Economics, Vol. 10, 1980, pp.151-75, have developed formal models of intra industry trade which are based on monopolistic competition and the presence of economies of long-run or batch production.

centres of production, and a consumption effect, as demand for the products increases, can be identified.

This source of economies of scale should be distinguished from economies of firm or plant size, since each plant in this model is assumed to produce more than one product. Economies of firm or plant size may result in inter industry specialisation³², rather than intra industry trade.

Finally, the pattern of specialisation may not develop in line with comparative advantage. In effect, favourable factor prices may be negated by the fall in unit costs which arise from the increased length of production runs.

4. Product specific advantages. The incidence of intra industry trade may also be explained, in some industries, by innovation and the product cycle. Substitutes for existing products may be developed and sold in the partner country. If these goods are protected by patents, or copyright, intra industry trade may take place in similar products which have identical factor intensities³³.

The second question which must be considered, is what factors underlie and determine the pattern of intra industry trade and specialisation? The theories developed by Linder³⁴ and Drèze³⁵ may provide some insight into this question.

32 See p. 19.

33 For a detailed discussion of this case see Grubel and Lloyd, op. cit., pp. 102-112.

34 Linder, S.B. An Essay on Trade and Transformation, John Wiley and Sons, New York, 1961.

35 Drèze, J. 'Quelques réflexions sereins sur l'adaptation de l'industrie belge au Marché Commun', Comptes Rendues des Travaux de la Société Royale d'Economie Politique de Belgique, 275, December 1960.

Linder argued that countries would specialise in those qualities which are demanded by the majority of their population and import those commodities which are demanded by minority groups. This implies that a country with a relatively high average income level will specialise in relatively high quality goods, and import goods of inferior quality from countries with lower average income levels.

Drèze has suggested that the pattern of specialisation will be determined by the style, design and equipment characteristics most desired by the residents of each nation. Thus the UK might be expected to specialise in, and export, reproduction regency furniture, and import colonial style furniture from the USA. Small countries are hypothesised to specialise in standardised products because the size of the home market will limit the economies available from batch and long production runs.

Economies of batch and long production runs underlie the pattern of specialisation which develops in both the Linder and Drèze models. These economies will be reinforced by product specific inputs such as experience in the design, manufacture and marketing of the product which will be available at the level of the firm.

The models developed by Drèze and Linder suggest that the pattern of specialisation, and the amount of intra industry trade, will be related to the degree of similarity between the per capita income levels in the trading partners. The greater the degree of similarity, the higher will be the potential for intra industry trade, since the countries will have similar demand attributes with respect to quality and product sophistication.

Finally, the formal models developed by Krugman³⁶ and

³⁶ Krugman, op. cit.

Lancaster³⁷ suggest that trade between countries with similar factor endowments will take the form of intra, rather than inter, industry trade.

Implications of the analysis for the impact of UK entry into the EC on UK trade flows. The analysis suggests that UK entry into the EC should have provided the scope for a substantial increase in intra industry trade between the UK and the EC(6), since the partners have similar per capita incomes and produce a range of similar differentiated products.

According to the theory, intra industry trade will take place if the UK and the EC(6) each possess an absolute cost advantage in one, or more, brands in the i^{th} industry for which a demand is present in both the UK and the EC(6), as long as the absolute cost advantage is greater than the tariff and non-tariff barriers to trade. In this case a fall in tariffs will result in an increase in intra industry trade.

The change in the pattern of intra industry trade at the industry level will be determined by the height of tariff and non-tariff barriers between the UK and the EC(6) in the pre- and post-entry periods, and the degree of product differentiation within the i^{th} industry, and hence the potential for intra industry trade. Specialisation within the i^{th} industry will be determined by the distribution of absolute cost advantages, where the distribution of absolute cost advantages will reflect economies of batch and long-run production, product innovation and product specific skills and knowledge.

37 Lancaster, op. cit.

Finally, the analysis suggests that the opportunities for intra industry trade in functionally homogeneous manufactured goods between the UK and the EC(6) will be limited, both because of the relatively small proportion of total costs accounted for by transport costs in these commodities, and the geographical barrier to trade imposed by the Channel.

Conclusion

In this chapter the predictions of traditional customs union theory and intra industry trade theory for the impact of UK entry into the EC on UK trade flows, have been analysed.

Traditional customs union theory predicts that UK entry into the EC will result in an increase in trade and inter industry specialisation between the UK and the EC(6), based on the pattern of comparative advantage. This increase in inter industry specialisation will be positively related to the difference in factor endowments between the partner countries, and the fall in tariff and non-tariff barriers which occurs after entry.

In contrast, the theory of intra industry trade predicts that UK entry into the EC will result in an increase in intra industry trade between the UK and the EC(6). In this case specialisation takes place within industries and is based on the distribution of absolute cost advantages which arise from economies of batch, or long production runs, innovation and product specific skills. The increase in intra industry trade will be positively related to the degree of similarity in per capita incomes between the partner countries, the proportion of total output in each of the partners which is accounted for by differentiated products, and the fall in tariff and non-tariff barriers, which occurs after entry.

CHAPTER 2

The Impact of UK Entry into the EC(6) on the Pattern
of UK Trade: A Review of the Literature

Introduction

Although the impact of UK entry into the EC on UK trade flows has been the subject of a substantial pre- and post-entry debate, the ex post empirical literature is relatively sparse. Kreinen¹ has estimated the trade creation and trade diversion effects of EC enlargement, and a small number of ex post studies of the impact of UK entry into the EC on UK trade flows at the aggregate or sectoral levels have been carried out². These aggregate studies have been supplemented by a number of industry level case studies³.

With the exception of Owen⁴ the aggregate and sectoral studies of the impact of UK entry into the EC on UK trade flows have concentrated on measurement rather than explanation. None of the studies has attempted to explain the impact of UK entry into the EC on the commodity composition of UK trade within a theoretical framework derived from customs union theory.

1 Kreinen, M.E. 'Static Effects of EC Enlargement on Trade Flows in Manufactured Products', Kyklos, Vol. 34, 1981, pp.60-71.

2 See Morgan, A.D. 'The Balance of Payments and British Membership of the European Community', in Wallace, H. (ed.) Britain in Europe, Heineman, 1980; Winters, L.A. 'Britain's Trade Patterns Since Joining the Common Market', British Review of Economic Issues, forthcoming; Daly, A.E. 'UK Visible Trade and the Common Market', National Institute Economic Review, Vol. 86, November 1978, pp.42-54; Fetherston, M., Moore, B. and Rhodes, J. 'EEC Membership and UK Trade in Manufactures', Cambridge Journal of Economics, 1979, Vol. 3.

3 See for example: Shepherd, G. 'British Manufacturing Industry and the EEC', in Cohen, C.D. (ed.) The Common Market. Ten Years After, Oxford: Philip Allen, 1983.

4 Owen, N. Britain's Pattern of Specialisation, unpublished Department of Trade working paper, ref. L.T.W.G.(77).18.

However, a review of this literature does serve two important purposes. Firstly, it highlights the methodological and empirical problems which must be considered before satisfactory estimates of the impact of UK entry into the EC on UK trade flows can be obtained. The conceptual and methodological problems which these studies seek to overcome are, of course, similar to those which faced researchers investigating the trade effects of EC formation. However, whilst a substantial body of literature investigating the trade effects of EC formation has developed, this body of literature has been extensively reviewed by Mayes⁵ and Sellekaerts⁶ and will not, therefore, be discussed in this chapter.

Secondly, the aggregate and sectoral estimates of the impact of UK entry into the EC on UK trade flows provide a framework within which the results generated in this study can be considered.

The chapter is divided into two sections. The aggregate studies of the impact of UK entry into the EC are critically reviewed in section I. The disaggregated studies are critically reviewed in section II.

Section I - Aggregate estimates of the impact of EC enlargement on UK trade flows

The basic problem which each of the studies of the impact of UK entry into the EC on UK trade flows seeks to overcome is the derivation of an ante-monde, or hypothetical estimate of the pattern of trade in the absence of UK entry into the EC, with which to

5 Mayes, D.G. 'The Effects of Economic Integration on Trade', Journal of Common Market Studies, Vol. XVII, No. 1, September 1978, pp.1-25.

6 Sellekaerts, W. 'How Meaningful are Empirical Studies on Trade Creation and Trade Diversion?', Weltwirtschaftliches Archiv, Vol. 28, No. 4, December 1973, pp.519-53.

compare actual trade flows after UK entry. The difference between the predicted pattern of trade and the actual pattern of trade is then ascribed to UK entry.

The accuracy of these estimates is dependent on two factors: firstly, accurate location of the point in time at which the pattern of UK trade first diverges as a consequence of UK entry into the EC, and secondly the extent to which the ante-monde satisfactorily compensates for changes in the pattern of UK trade which are unrelated to EC entry.

Selection of the base year. Whilst the UK entered the EC in January 1973, selection of this date as the base year may result in the underestimation of the impact of EC entry on UK trade flows if companies had anticipated EC enlargement. Fetherston, Moore and Rhodes⁷ use 1973 as the base year for their analysis. Morgan⁸, on the other hand, estimates the impact of EC enlargement on the pattern of UK exports using 1972 both to calculate the pre-entry trend and as the base year for actual trade flows after enlargement. If an anticipation effect is present the results obtained by Fetherston, Moore and Rhodes will underestimate the impact of EC entry on UK trade flows. Those obtained by Morgan may, or may not, depending on the year in which the anticipation effect first became apparent.

7 Fetherston, Moore and Rhodes, op. cit.

8 Morgan, op. cit.

The ante-monde. The difference between the ante-monde and the actual pattern of trade is ascribed to UK entry into the EC. However, the difference between the actual and the predicted trade flows will reflect not only the impact of integration, but also any specification error in the model from which the ante-monde was derived.

Ideally a trade model which explains the pattern of trade between the UK, other EC member countries and third countries should be specified and estimated⁹. This model would contain a range of variables which might include economic activity, capacity utilisation, population, prices and non-price competitiveness within countries, and the degree of geographical separation between countries. The effect of UK entry on trade flows should then be calculated using the estimated parameters for the pre-entry period.

In practice the studies reviewed in this section use a simpler technique which is based on the extrapolation of pre-entry trends into the post-enlargement period. These trends are then adjusted for changes in competitiveness and demand, during the post-enlargement period, using a variety of techniques, and compared with actual trade flows. The difference between the actual and the predicted trade flow is then ascribed to EC enlargement.

If satisfactory estimates are to be obtained, the extrapolated pre-entry trend must be adjusted first for the persistent decline in the UK's share of world manufactured exports¹⁰, and second for the counter-cyclical relationship which exists between the change in the

⁹ For a full discussion of the problems associated with the specification of a satisfactory ante-monde, see Mayes, op. cit.

¹⁰ For evidence of this decline see Connell, D. 'The UK's Performance in Export Markets. Some Evidence from International Trade Data', Discussion Paper 6, NEDO, London, 1979.

UK's share of world manufactured exports and the business cycle¹¹.

Thus the UK's share either falls more slowly or increases during periods of recession. Finally, recent evidence¹² suggests that UK non-price competitiveness has declined during the post-war period and further that this decline has accelerated since enlargement.

Morgan¹³ examined the development of UK manufactured exports during the post-entry period in the context of a constant market share analysis of the exports of fifteen countries: the Nine, the USA, Canada and Japan, and the four industrialised EFTA countries. The ratio of the actual growth of UK manufactured exports to the potential growth of UK manufactured exports was estimated for six different markets. The potential growth of UK manufactured exports was calculated under the assumption that the UK share of the manufactured exports of the fifteen countries would have remained constant in each time period. The ratios are presented in Table 2.1. A value of less than one shows a fall in the UK share during the period under consideration. When the ratio is greater than one this indicates an increase in the UK share of the j^{th} market.

In order to estimate the impact of EC enlargement on UK export performance Morgan extrapolated the change in the UK share of the exports of the fifteen to the EC(6), EFTA, Ireland and Denmark and the old Commonwealth in the pre-entry period 1968-72, into the post-

11 See Connell, op. cit.

12 Ibid.

13 Morgan, op. cit.

entry period 1972-76. Thus both the increase in the ratio for the EC(6) and the whole of the decline in the ratios for EFTA, Ireland and Denmark, and the old Commonwealth, were ascribed to EC enlargement.

Table 2.1 Ratio of the Actual Growth of UK Exports of Manufactures to Exports at Constant Market Shares^a

Exports to:	1964-68	1968-72	1972-76	1976-77
EC(6)	0.19	0.76	1.34	2.16
Ireland and Denmark	0.80	1.00	0.73	2.09
EFTA ^b	0.67	0.86	0.60	1.40
USA	0.70	0.69	0.87	0.63
Canada, Australia and New Zealand	0.03	0.50	0.36	1.33
All other countries	0.27	0.83	0.59	1.48
World	0.32	0.73	0.76	1.49

a Trade in diamonds, silver, ships, aircraft, aero-engines and works of art is excluded.

b Austria, Norway, Sweden and Switzerland only.

Source: Morgan, op. cit.

Since the method is based on the extrapolation of pre-entry trends into the post-entry period, the method takes account of the decline in the UK share of world manufactured exports which has characterised the post-war period. However, the method is based on the implicit assumption that the UK entry into the EC was the only factor to affect the share of UK exports in the exports of the fifteen to the EC(6), EFTA, Ireland and Denmark, and the old Commonwealth. Thus relative prices, non-price competitiveness and demand are either assumed to change at the same rate in the post-entry period (1972-76)

as in the pre-entry period (1968-72), or to be independent of changes in the UK's share of the exports of the fifteen. This assumption is clearly open to question.

The method ignores the counter-cyclical relationship between the share of world manufactured exports held by the UK and the business cycle. 1972, a boom year, is used to calculate both the pre-entry (1968-72) and post-entry (1972-76) ratios. This implies that the pre-entry ratios will be underestimated and the post-entry ratios will be overestimated. Finally, if the decline in UK non-price competitiveness has accelerated during the post-entry period the increase in UK exports to the EC as a consequence of enlargement will be underestimated, if the ante-monde is calculated by extrapolating the uncorrected pre-entry trend. In addition, part of the decline in the share of UK exports, in the exports of the fifteen to the Commonwealth, EFTA, Ireland and Denmark, which is ascribed to UK entry by Morgan, may have arisen as a consequence of the accelerated decline in UK non-price competitiveness rather than EC enlargement.

Morgan attempted to compensate for the accelerated decline in UK competitiveness by estimating the impact of UK entry into the EC on the share of UK exports for the period 1976-77, under the alternative assumption that the UK would have done as well in the EC as in the rest of the world, in the absence of integration.

Since the method attributes the difference between UK performance in the rest of the world and the EC in the post-entry period to EC enlargement, all other factors are either assumed to change at the same rate in both markets, or not to affect the pattern of UK trade. Thus UK prices are assumed to change at the same rate

relative to both the EC and the rest of the world. Similarly the markets of both the EC and the rest of the world are assumed to grow at the same rate and to operate on the same trade cycle. If these conditions are not fulfilled the estimates will be biased.

Finally, it is unclear why this method was used to estimate the impact of UK entry into the EC on UK exports for the period 1976-77 but not for the period 1972-76. If the decline in UK competitiveness did accelerate in the period 1972-76, the results will continue to understate the increase in the UK share of EC imports which arises as a consequence of EC enlargement.

Fetherston, Moore and Rhodes¹⁴ and Winters¹⁵ estimate the balance of payments effects of EC entry on UK exports by measuring the deviation of actual trade flows after enlargement from the extrapolated pre-entry trend calculated for the periods 1958-72 and 1963-72 respectively.

Since relative costs and the level of demand may have changed in the absence of EC enlargement, both Fetherston, Moore and Rhodes, and Winters adjust the extrapolated pre-entry trend for changes in demand and relative unit labour costs.

Fetherston, Moore and Rhodes adjust the UK's share of the exports of the EC(9) to the EC(8) and the rest of the world using five different sets of elasticities. The elasticities were based on typical elasticities estimated by other researchers¹⁶. A geometrically

14 Fetherston, Moore and Rhodes, op. cit.

15 Winters, op. cit.

16 Particular use was made of Stern, R.J., Francis, T. and Schumacher, B. Price Elasticities in International Trade, Macmillan, 1976.

declining lag structure was adopted for the relative cost term, implying that export shares adjust to changes in relative costs with a two-year lag. Deviations from the adjusted pre-entry trend are then ascribed to EC enlargement.

Winters estimated import functions for the EC(8), the USA, Canada and Japan. The share of UK manufactured imports in the total imports of each of the markets was expressed as a function of a time trend, total imports and relative normalised unit labour costs. The equation was estimated for the period 1963-72 using ordinary least squares. The predicted UK share was then compared with the actual UK share after enlargement.

The technique used by Fetherston, Moore and Rhodes, and Winters has two clear advantages over the simple extrapolation of the change in pre-entry shares. In the first case it takes account of changes in relative prices in the post-entry period. Secondly, the impact of cyclical influences on the UK share of imports is controlled through the inclusion of a demand variable.

However, since the impact of EC enlargement on UK trade flows is estimated as the difference between the actual and the predicted trade flows, the estimates will be biased if specification errors are present. Errors of omission and errors in variables can be identified.

Whilst Fetherston, Moore and Rhodes, and Winters adjust the extrapolated pre-entry trends for changes in relative prices and demand, neither of the models incorporates a measure of non-price competitiveness. Both models will, therefore, tend to underestimate the impact of EC enlargement on UK exports. In addition the relative

cost variable in both studies is based on relative normalised unit labour costs. This implies that the relative cost variables will be biased if individual manufacturing industries account for differing proportions of UK exports and output.

The specification of the lag structure for the relative price variable also poses some problems. Fetherston, Moore and Rhodes assume that export shares will adjust, in response to a change in relative costs, in two years. Winters, on the other hand, makes the implicit assumption that adjustment is instantaneous. Kravis and Lipsey¹⁷ investigated the relationship between market share and relative prices using a number of different lag structures. They found that whilst the unlagged relative price variable provided little explanation of the variation in the dependent variable ($\bar{R}^2 = 0.01$), the introduction of a lagged specification substantially improved the degree of explanation provided by the model ($\bar{R}^2 = 0.47$).

This finding, and the absence of a satisfactory lag structure in the model used by Winters, may explain the negative but insignificant, and the positive but significant, signs on the relative price variable which cast doubt on the size of the EC effect calculated by Winters.

Finally, both studies investigate the change in the share of the UK in the total imports of the EC(8) rather than the EC(6). The rationale for this procedure is unclear since both Ireland and Denmark were members of EFTA in the pre-entry period. This implies

17 Kravis, I.B. and Lipsey, R.E. 'Prices and Market Shares in the International Machinery Trade', Review of Economics and Statistics, Vol. LXIV, PEL, 1982, pp.110-16.

that EC enlargement will have left the tariff on the trade in manufactured goods between the UK and Denmark and Ireland unchanged.

All of these estimates of the impact of UK entry into the EC on UK export performance are based on the implicit assumption that total EC and world imports were unaffected by EC entry. They take no account, therefore, of trade creation.

Morgan argues that this assumption may be justified, since three-quarters of EC manufactured imports from the industrial countries were supplied by the member states in the pre-entry period. This implies that the average tariff on EC manufactured imports was low and the opportunities for trade creation would, therefore, be limited. However, since the reduction in UK tariffs was substantial, and trade creation could be expected, the same methods could not be applied to the analysis of the change in UK imports.

In order to overcome this problem Morgan, Fetherston, Moore and Rhodes, and Winters substitute total expenditure for total imports as the measure of demand, and estimate a series of import functions for the UK.

Morgan estimated import demand functions for UK imports of manufactures and semi-manufactures for the period 1959-77. The change in the volume of imports was explained in terms of three independent variables: domestic expenditure at constant prices, import prices - adjusted for tariff changes, relative to domestic wholesale prices - and a set of dummy variables which were designed to pick up the effect of the fall in tariffs occasioned by the formation of EFTA, the Kennedy Round and UK entry into the EC. The fall in tariffs after entry was then calculated, and the estimated price

elasticities of -1.1 and -1.7 for manufactures and semi-manufactures respectively were used to calculate the impact of EC membership on UK imports.

Winters regressed current relative prices, current total UK expenditure and a dummy variable which took the value 0 between 1952 and 1972, 1 in 1972, 3 in 1973, increasing to 9 in 1979, on the share of the j^{th} country in total included UK expenditure.

The equation was estimated for eleven countries including the UK for the period 1952-79. The impact of UK entry into the EC on the pattern of UK imports is measured by the change in the intercept between the UK's non-EC and EC phases, but with the adjustment spread over the period 1972-79.

Fetherston, Moore and Rhodes adjusted the extrapolated pre-entry trend, calculated for the period 1963-72, for imports from the EC(8) and the non-EC countries respectively for changes in total final expenditure in the UK and changes in relative labour costs. Imports from the EC(8) were adjusted for changes in UK unit labour costs relative to the EC(8), and EC(8) labour costs relative to the rest of the world. Imports from the non-EC countries were adjusted for changes in UK labour costs relative to the rest of the world, and changes in EC(8) labour costs relative to the rest of the world. The adjustments were based on a set of estimated elasticities obtained from the literature. The difference between the adjusted extrapolated trend and actual UK imports from the EC(8) and the rest of the world was then ascribed to EC enlargement.

Thus, whilst Morgan investigates the net effect of EC enlargement on UK imports of finished and semi-finished manufactures,

Fetherston, Moore and Rhodes, and Winters estimate separate import functions for imported manufactured goods from the EC and the non-EC countries. They are, therefore, able to estimate the impact of EC enlargement on the share of UK imports supplied by the EC countries.

These estimates are, of course, open to the same criticisms as the estimates of the impact of UK entry into the EC on UK exports, obtained by Fetherston, Moore and Rhodes, and Winters, and discussed in the preceding section. Thus, Fetherston, Moore and Rhodes, and Winters omit any measure of non-price competitiveness. The results are, therefore, likely to overestimate the increase in import penetration which has arisen as a consequence of UK entry. In addition only Morgan takes account of the continuing liberalisation in world trade which has taken place during the sixties and seventies. This implies that part of the change in the pattern of UK trade ascribed to UK entry into the EC by Fetherston, Moore and Rhodes, and Winters should be ascribed to the implementation of GATT and the Kennedy Round.

Aggregate estimates of the impact of EC enlargement on UK trade flows: the results. The results obtained by Fetherston, Moore and Rhodes under a set of intermediate elasticity assumptions are shown in Table 2.2. They suggest that EC entry has had a large negative impact on the UK balance of payments, a steadily improving export performance being more than offset by a rapid increase in EC import penetration of the UK home market. Thus Fetherston, Moore and Rhodes calculated that EC enlargement resulted in an increase in UK exports of £111 m in 1977 and an increase in UK imports of £2055 m. This results in a net loss on the balance of trade of £1944 m.

Table 2.2 Conditional Estimates of the EEC Effect on UK Manufacturing Trade on Intermediate Elasticity Assumptions (£ million at 1970 prices)

	1	2	3	4	5	6	7
	Exports to non-EEC	Exports to EEC	Total Exports	Imports from non-EEC	Imports from EEC	Total Imports	Total Exports Minus Imports
1973	-318	78	-240	-335	897	562	-802
1974	-654	167	-487	-475	1317	842	-1329
1975	-364	305	-59	-776	1452	676	-735
1976	-426	342	-84	-778	1615	837	-921
1977	-396	507	111	-494	2549	2055	-1944
Annual average							
1973-77	-432	280	-152	-572	1566	994	-1146

44

Notes: figures in columns 1, 2, 4, 5 are computed under the following elasticity assumptions:

	Demand	Relative Costs
Exports (Shares)	0	1.5
Imports (Levels)	2	1.5

Column 3 = column 1 + column 2

Column 6 = column 4 + column 5

Column 7 = column 3 - column 6

Source: Fetherston, Moore and Rhodes, op. cit.

This result can be contrasted with the small net improvement in the balance of trade estimated by Morgan. Thus Morgan calculated that EC enlargement resulted in an increase in UK exports of between £1075 m and £1125 m, and an increase in UK imports of between £750 m and £850 m. This results in a net improvement on the balance of trade between 1972 and 1977 of between £225 m and £375 m. How can this result be reconciled with the substantial net loss estimated by Fetherston, Moore and Rhodes? Two explanations for this discrepancy can be suggested:

1. Interpretation of the estimates. Fetherston, Moore and Rhodes calculate the export effect by summing the difference between the actual and predicted UK share of EC exports to the EC and the non-EC countries respectively. Both the fall in the UK's share of the non-EC markets and the increase in the UK's share of EC imports are ascribed to EC enlargement. Thus, in contrast to most of the customs union literature, the assumption of infinite supply elasticities is discarded¹⁸. It is implicitly assumed that the fall in the UK share of non-EC markets is caused by export trade diversion and a decline in UK industrial competitiveness which has arisen as a consequence of EC enlargement. Two factors are argued to underlie the decline in competitiveness. Firstly, the constraint imposed on the level of output in the UK by the balance of payments; secondly, the strong competitive position of the original members of the EC in the entry period.

18 See Mayes, op. cit.

Under these conditions imports may have grown faster than exports in the post-entry period, resulting in a balance of payments imbalance and the restriction of output growth in the UK. Fetherston, Moore and Rhodes then argue that this process could result in a decline in UK competitiveness since economies of scale may be lost.

However, the performance of the UK in non-EC countries may reflect the decline in UK non-price competitiveness observed during the period. Thus Connell¹⁹, Stout²⁰, Rothwell²¹ and Saunders²² have investigated the relationship between relative tonne or unit values and market shares at the three- and four-digit levels of the SITC. The results suggest firstly that UK tonne values tend to be lower than those of their competitors, and secondly that relative tonne values are positively related to export shares. The positive relationship may be explained either by product heterogeneity within the three- and four-digit SITC groups or by differences in technical sophistication and non-price competition, where differences in the product mix may, themselves, reflect past R & D decisions. The results imply either that UK manufacturing exports are less competitive

19 Connell, op. cit.

20 Stout, D. International Price Competitiveness, Non-Price Factors and Export Performance, NEDO, 1977.

21 Rothwell, R. 'The Role of Technical Change in International Competitiveness', Management Decision, Vol. 15, No. 6, 1977, pp.542-49.

22 Saunders, C. 'Engineering in Britain, West Germany and France: Some Statistical Comparisons', Sussex European Papers, No. 3, 1978.

in non-price terms than those of its principal competitors, or that the UK produces a different mix of products with lower tonne values, within each three- or four-digit SITC commodity group.

Overall the evidence appears to suggest that the UK has become progressively less competitive in non-price terms during the post-war period. Both Saunders and Connell have analysed trends in tonne values for the UK, France and West Germany.

The results (Table 2.3) suggest that the tonne values of French and West German exports have risen faster than those of the UK. In addition, the decline in UK tonne values relative to our principal competitors appears to have accelerated during the seventies.

Table 2.3 Median Tonne Values of Engineering Exports*

	UK % Δ	FRG % Δ	France % Δ
1963	2.28	2.58	2.53
1971	3.08 (35.1)	4.05 (56.9)	3.43 (37.0)
1975	4.79 (55.5)	7.61 (87.0)	6.73 (96.2)

* \$ 000's per tonne

Source: Saunders, op. cit.

To quote Saunders:

"The differences in tonne values which apply to nearly all engineering products, have developed in the last few years. The differences were much smaller in 1971 and smaller still in 1963. They suggest that British exporters have been moving progressively down market in relation both to

West German and French exporters, while the British share of the world market was falling."²³

Thus, to the extent that relative tonne values represent an adequate proxy for non-price competitiveness, two conclusions can be drawn. Firstly, the decline in the UK's share of manufactured exports can be partly explained by a failure to compete in non-price terms with our principal competitors. Secondly, the failure to compete in non-price terms appears to have accelerated during the post-entry period.

If this is so, and this decline is unrelated to UK entry into the EC, UK export performance in third country markets should be used as a control with which to compare UK performance in the EC. In this case column 1 in Table 2.3 should be subtracted from, rather than added to, column 2. The adjusted estimates are presented in column 2 of Table 2.4.

Although adjustment of the estimates results in a marked decline in the net loss on the balance of trade estimated by Fetherston, Moore and Rhodes, a substantial difference between the estimates provided by Fetherston et al. and Morgan still exist. Since the export gain estimated by Fetherston, Moore and Rhodes, after adjustment, is roughly comparable to the gain estimated by Morgan - £903 m and between £1075 m and £1125 m respectively - the difference in the estimated impact on the balance of trade, after adjustment, must be explained by a divergence in the estimated effect of enlargement on UK imports.

²³ Saunders, op. cit., p.83.

Table 2.4 Estimates of the Effect of EC Enlargement on the UK
Balance of Trade in Manufactured Goods

	Col. 1	Col. 2	Col. 3
Year	Fetherston et al. ¹	Fetherston et al. ²	Morgan ³
1973	-802	-166	
1974	-1329	-21	
1975	-735	-7	
1976	-921	-69	
1977	-1944	-1152	>225 <375

1 Source: Fetherston, Moore and Rhodes, op. cit. Results calculated under a set of intermediate elasticity assumptions.

2 Source: Fetherston, Moore and Rhodes, op. cit. Results calculated under a set of intermediate elasticity assumptions and adjusted in the manner discussed above.

3 Source: Morgan, op. cit.

2. Estimation of the import functions. Whilst Fetherston, Moore and Rhodes, and Morgan both estimate the impact of UK entry on UK imports using import functions, the results are obtained in fundamentally different ways.

Morgan estimated separate import functions for manufactures and semi-manufactures. The impact of EC entry on UK imports was then calculated using the estimated price elasticities and the change in UK tariff.

In contrast, Fetherston, Moore and Rhodes adjust the extrapolated pre-entry trend for changes in expenditure and relative prices during the post-entry period. The difference between the extrapolated pre-entry trend and the actual flow of imports in the post-entry period was then attributed to UK entry into the EC. This implies that any increase in imports into the UK, which arises because of a decline in UK competitiveness, will be attributed to UK entry into the EC if it is not controlled within the model.

Thus, since the model developed by Fetherston, Moore and Rhodes does not incorporate the decline in UK non-price competitiveness, which occurred in the post-entry period, or the impact of the Kennedy Round and GATT on UK imports, the model will overestimate the increase in UK imports which can be ascribed to EC enlargement.

Finally, the estimates generated by Fetherston, Moore and Rhodes, and Morgan are strongly dependent on the size of the estimated price elasticities. Thus the net increase in UK imports estimated by Fetherston, Moore and Rhodes

varies between £525 m and £2097 m, depending on the value of the price elasticity. Since Fetherston, Moore and Rhodes use a price elasticity of -1.5, whilst Morgan calculates the impact of entry on the import of finished and semi-finished goods into the UK using estimated price elasticities of -1.1 and -1.7 respectively, part of the divergence in import estimates may be explained by differences in estimated or assumed price elasticities of demand.

The problems which must be overcome if satisfactory estimates of the price elasticity are to be obtained are substantial and well-known²⁴. The sensitivity of the results to changes in the value of the price elasticity must, therefore, cast some doubt on the validity of the estimates generated by Fetherston, Moore and Rhodes, Morgan, and Winters.

Disaggregated estimates of the impact of enlargement on UK trade flows.

Daly²⁵ has investigated the impact of UK entry into the EC on UK trade performance in the commodity groups at the sectoral level. The results have subsequently been updated by Mayes²⁶.

Daly's methodology can be divided into two stages:

1. A time trend was fitted to the UK share of total EC imports, and the EC share in total UK imports, for the period 1963-71.

24 Kravis and Lipsey, op. cit.

25 Daly, op. cit.

26 Mayes, D.G. 'EC Trade Effects and Faster Mobility', in El-Agraa, A.M. (ed.) Britain Within the European Economic Community: The Way Forward, Macmillan, 1983, pp.88-124.

Actual trade performance in the period 1973-76 was then compared with the extrapolated time trend. 1963 and 1971 were selected as base years because they were years of relatively low economic activity.

2. A time trend was fitted to the UK share in the total imports of Ireland and Denmark; EFTA; USA, Canada and Japan; and Australia, New Zealand and S. Africa, for the period 1963-71. The same procedure was repeated for the exports of these countries to the UK. These results were then used as a control with which to compare UK trade performance in the EC.

To quote Daly:

"It seems reasonable to assume that if, for example, UK export share in all three country groups fall, in contrast to an improvement in the case of the EEC, there was some 'Common Market' effect on British exports."²⁷

Daly concluded:

"The imports from and exports to the six of chemicals, textiles, machinery and iron and steel and manufactured metal products all appear to be higher than they would have been if the UK had stayed outside the EC. UK exports of transport equipment and other manufactures classified chiefly by material, and miscellaneous manufactures also increased above the trend projection in the post entry years."²⁸

The study is, however, of limited value. Daly made little attempt to quantify the impact of EC enlargement on UK trade flows, or to assess the relative impact on different industries. Thus no attempt was made to normalise the estimates of the EC effect using UK performance in third markets as a control. They were only used

²⁷ Daly, op. cit., p.45.

²⁸ Ibid., p.54.

as a qualitative check on the direction of the effect. In addition, the method assumes that EC entry is the only factor which affects the trend after entry. In effect relative prices and GNP are assumed either to be constant or neutral with respect to export share. This problem is recognised by Daly, who argues that the common market effect on British exports may be overestimated, since NIESR estimates suggest that UK competitiveness increased relative to the EC. However, the NIESR index of competitiveness was calculated as the competitive world price of manufactures divided by the UK unit value index for exports of manufactures and, as argued in the preceding sections, unit values reflect not only price competitiveness but also non-price competitiveness. In this case the fall in the index may reflect a decrease in non-price competitiveness, rather than an increase in price competitiveness.

The study by Daly generated some qualitative estimates of the impact of the EC on the trade flows of individual commodity groups. However, the level of aggregation was relatively high and no attempt was made to assess or explain the impact of the EC on the UK's pattern of specialisation.

In a recent working paper, Owen²⁹ analysed UK trade performance between 1970 and 1975, in 96 minimum list heading industries, overcoming both of these problems to some extent.

Owen suggested that the fall in UK wage costs relative to other EC countries, and entry into the high wage EC club, raised three distinct questions.

1. Has entry into the EC encouraged greater specialisation in line with the pre-entry trade pattern?

²⁹ Owen, op. cit.

2. Has the fall in UK wage costs relative to the EC countries resulted in a new trade pattern which favours labour intensive industries?
3. Does this change in UK trade specialisation imply increasing conflict with the industrialising countries in EC markets?

In the first stage of the analysis the change in the pattern of UK trade between 1970 and 1975 with the world, the OECD, the EC, and the LDCs was investigated. The analysis was carried out at the MLH level using two measures of specialisation:

1. The average sectoral trade balance/consumption ratio, relative to the average for the UK.
2. The standard deviation of the average sectoral trade balance/consumption ratio.

Owen found that UK trade with the world and the OECD had become less specialised. In addition, there was little evidence that UK trade with the EC had become more specialised. However, the results did suggest that while the pattern of trade between the UK and the world had remained relatively stable, a substantial change had taken place in the pattern of trade between the EC and the UK. As Owen notes:

"EC membership has not encouraged industries which were previously successful in the EEC to do better; the EC has proved a turbulent environment for British business and has appeared to have shaken up Britain's EEC trade pattern to the extent that it no longer has very much resemblance to the pattern of trade with the world generally."³⁰

In the second part of the paper Owen investigates the factors underlying Britain's pattern of specialisation using a multiple

³⁰ Owen, op. cit., p.3.

regression model based on the theory of factor proportions. UK specialisation was explained by a set of independent variables which included labour, human capital, capital, concentration and foreign ownership. In the light of the decline in UK labour costs, he hypothesised that "the UK comparative advantage lies in labour intensive industries, particularly those requiring high quality labour"³¹.

Whilst the model does provide some explanation of the UK's pattern of trade with the LDCs it failed to "make any sense at all of the UK-EC trade pattern"³². Owen suggests that the poor explanatory power of the model, with respect to the EC, arose because of the inability of the skill/knowledge variable to differentiate sharply between the UK and EC countries. On the other hand, the skill element does differentiate sharply between the UK and the LDCs.

These results are not surprising. Steinherr and Runge³³, and Wolter³⁴, who analysed West German trade performance, have argued that different models should be used to explain trade with underdeveloped and developed countries respectively. Thus the neo-factor proportions model should be used to explain trade with underdeveloped countries, while the neo-technology hypothesis, which stresses the role of inter country differences in the capability to innovate, and inter industry differences in susceptibility to innovations, should

³¹ Owen, op. cit., p.6.

³² Ibid., p.8.

³³ Steinherr, A. and Runge, J. 'The Evolution of West Germany's Structure of Foreign Trade from 1962-1972', Z. Ges. Staatswiss., Vol. 134 pt 2, June 1978, pp.301-26.

³⁴ Wolter, F. 'Factor Proportions, Technology and West German Industry's International Trade Patterns', Weltwirtschaftliches Archiv, Vol. 113, No. 2, 1977, pp.250-67.

be used to explain trade between developed countries.

In addition, both Panic and Rajan³⁵, and Woodward³⁶ have pointed out that the advanced industrial countries tend to perform well in the same fast-growing high technology industries. This suggests that much of the increase in trade, and hence the change in pattern, has arisen as a consequence of intra industry rather than inter industry specialisation.

The growth in the proportion and amount of intra industry trade in the total trade in manufactured goods between the original members of the EC after the formation of the EC, has been documented and discussed by Balassa³⁷, Grubel³⁸, Grubel and Lloyd³⁹, and Sazanami and Hamuguchi⁴⁰.

In addition, Kreinen⁴¹ has investigated the change in the proportion of intra industry trade between 1970 and 1976 for thirteen countries, which included the EC(6), the UK and six EFTA countries. The analysis was based on the measure of intra industry trade

35 Panic, M. and Rajan, A. Product Changes in Industrial Countries' Trade, NEDO, 1972.

36 Woodward, V.H. Differences in the Import Penetration of Manufactured Goods in Major EEC Countries. 1960-74, Paper prepared for the 4th European Conference on Industrial Organization and Structure, Sept. 1977.

37 Balassa, B. 'Tariff Reductions and Trade in Manufactures Among the Industrialized Countries', American Economic Review, Vol. 56, 1966, pp.466-478.

38 Grubel, H.G. 'Intra-Industry Specialization and the Pattern of Trade', Canadian Journal of Economics and Political Science, Vol. 33, Aug. 1967, pp.374-88.

39 Grubel, H.G. and Lloyd, P.J. Intra Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Macmillan, 1975.

40 Sazanami, Y. and Hamuguchi, N. 'Intra-Industry Trade in the EEC, 1962-1972', Keio Economic Studies, Vol. XV, pt 2, 1978, pp.53-68.

41 Kreinen, op. cit.

developed by Balassa (Equation 2.1).

Equation 2.1

$$\frac{1}{n} \sum \frac{X_i - M_i}{X_i + M_i}$$

where:

X_i and M_i refer to the country's export and import of commodity category i to and from the European OECD area, and n is the number of categories considered. The categories are the three-digit SITC in the manufacturing sector (section 5-8 SITC) yielding an n of 101.

The ratio approaches one as inter industry specialisation increases, and zero as intra industry specialisation increases.

The results, presented in Table 2.5, suggest that the proportion of intra industry trade increased in nearly all cases between 1970 and 1976. A marked reduction in the ratio estimated for the UK, from 0.32 to 0.27, can be observed. This implies that the proportion of intra industry trade in the UK's total trade in manufactured goods with the European OECD countries increased substantially during the period under consideration.

The extent to which these results support the contention, outlined in chapter 1⁴², that EC enlargement would result in intra industry, rather than inter industry, trade and specialisation is, however, open to doubt. The measure of intra industry specialisation,

⁴² See chapter 1, p.29.

Table 2.5 Representative Ratios of Trade Balances

<u>Country</u>	<u>1970</u>	<u>1976</u>
Belgium	0.35	0.32
Netherlands	0.36	0.33
France	0.25	0.25
Italy	0.40	0.40
West Germany	0.32	0.30
United Kingdom	0.32	0.27
Sweden	0.34	0.35
Switzerland	0.49	0.41
Denmark	0.47	0.44
Austria	0.43	0.41
Finland	0.60	0.56
Norway	0.62	0.59
Portugal	0.77	0.70

Source: Kreinen, op. cit.

selected by Kreinen, suffers from two drawbacks. Firstly, each of the industries is given an equal weighting. The measure does not, therefore, take any account of the relative size and importance of the industries in the sample⁴³. Secondly, the measure does not include a correction for any overall trade imbalance.

Both Grubel and Lloyd⁴⁴, and Aquino⁴⁵ have argued that the proportion of intra industry trade in total trade will be biased downwards if the overall trade in manufactured goods between the

43 For a detailed discussion of the merits of alternative measures of intra industry trade see Grubel and Lloyd, op. cit.

44 Ibid.

45 Aquino, A. 'Intra-Industry Trade and Intra-Industry Specialisation as Concurrent Sources of International Trade in Manufactures', Weltwirtschaftliches Archiv, Vol. 114, 1978, pp.275-95.

trading partners is not in balance, since imports cannot possibly match exports in every industry. Further, since the aggregate estimate is the sum of the individual industry estimates, these estimates must also be biased.

In order to overcome this problem, Grubel and Lloyd, and Aquino suggest that the estimates of intra industry trade should be adjusted for the overall trade imbalance.

This approach has been criticised by Greenaway and Milner⁴⁶, and Rayment⁴⁷. They have argued that adjustment of the estimates, because of an imbalance in manufactured trade, will have the effect of inflating the estimates of intra industry trade within manufacturing industries and the manufacturing sector, and suppressing inter industry specialisation between sectors.

However, since Kreinen is concerned with the estimation of changes in intra and inter industry specialisation within the manufacturing sector during the post-enlargement period, corrected estimates of the proportion of intra industry trade should have been calculated.

Since Kreinen failed to correct the estimates for differences in the overall trade imbalance in manufactured goods between countries and through time, the ratios should be treated with caution. A change in the ratio may reflect a change in the overall trade balance rather than a change in the proportion of intra industry trade. The reduction in the estimated ratio for the UK from 0.32 to 0.27 may,

46 Greenaway, D. and Milner, C. 'Trade Imbalance Effects and the Measurement of Intra Industry Trade', Weltwirtschaftliches Archiv, Vol. 117, 1981, pp.756-62.

47 Rayment, P.B.R. 'Intra-Industry Specialisation and the Foreign Trade of Industrial Countries', in Frowen, S.F. (ed.) Controlling Industrial Economies: Essays in Honour of Christopher Saunders, Oxford University Press, 1983.

therefore, reflect a reduction in the overall trade imbalance with the European OECD countries, rather than an increase in intra industry specialisation.

The interpretation of the estimates of intra industry specialisation is clouded by two further problems, categorical aggregation and normalisation:

Categorical aggregation. The estimates generated by Kreinen⁴⁸, Balassa⁴⁹, Sazanami and Hamuguchi⁵⁰, and Grubel⁵¹ are based on three-digit SITC data. The validity of these estimates of intra industry trade will depend on the extent to which the three-digit level of the SITC corresponds to the theoretical construct of an industry which underlies the concept of intra industry trade.

Intra industry trade can be broadly defined as the simultaneous import and export of commodities within the same industry. Gray⁵² refers to intra industry trade as 'the simultaneous exporting and importing of goods which use almost identical mixes of (generally applicable) inputs and which serve very similar purposes'. This implies that the commodities grouped within each industry should have very similar factor intensities and be close substitutes in demand.

However, since an attempt is being made to explain that part of the change in trade patterns which the theory of factor proportions

48 Kreinen, op. cit.

49 Balassa, op. cit.

50 Sazanami and Hamuguchi, op. cit.

51 Grubel, op. cit.

52 Gray, H.P. 'Intra-Industry Trade: The Effects of Different Levels of Data Aggregation', in Giersch (ed.) On the Economics of Intra Industry Trade, Tübingen, 1979, p.88.

and traditional customs union theory do not explain, this definition can usefully be restated as the importing and exporting of goods with virtually identical factor intensities.

The three-digit level of the SITC is a far from perfect proxy for this theoretical concept of an industry. Thus section six of the SITC (manufactured goods classified chiefly by material) is grouped into three-digit commodities largely on the basis of input similarity, whilst sections seven (machinery and transport equipment) and eight (miscellaneous manufactured articles) are classified on the basis of similarity of final output. None of the sections is classified on the basis of factor intensity, and within each three-digit group the list of products may include intermediate products and goods with widely differing final purposes or factor intensities. Thus SITC 714 (office machinery) includes, amongst other goods, non-electrical type-writers, postage franking-machines and electronic computers, whilst SITC 711 (power-generating machinery) includes nuclear reactors, motor vehicle engines, and jet and gas turbines for aircraft.

Since the three-digit commodity groups are not classified according to factor intensity, the estimates of intra industry trade within any three-digit SITC commodity group will be open to two sources of bias. Firstly, goods with different combinations of factor inputs may be included in the same three-digit grouping: the estimate will then be biased upward. Secondly, goods with identical factor inputs may be included in more than one three-digit group. In this case the estimate will be biased downwards⁵³.

The evidence would appear to suggest that the first source of

53 For an extensive discussion of this point see Aquino (1978), op. cit.

bias may be extensive. Finger⁵⁴ investigated the variation in factor inputs within and between three-digit SITC commodity groups, for US exports. He found no more tendency for factor proportions in US exports to be uniform within three-digit SITC groups than across such groups. This implies that a substantial proportion of intra industry trade at the three-digit level may be explained by categorical aggregation.

However, whilst some proportion of measured intra industry trade at the three-digit level can be accounted for by categorical aggregation, the evidence suggests that intra industry trade predominates.

Thus the estimates of intra industry trade at the 3rd, 4th and 5th digit levels, generated by Greenaway and Milner⁵⁵ and presented in Table 2.6, suggest that a substantial proportion of intra industry trade is still present at the 4th and 5th digit levels of the SITC.

Table 2.6 Average Levels of UK Intra Industry Trade, 1977

SITC Section	3-digit B_j^*	4-digit B_j	5-digit B_j
5	69	67	53
6	69	58	52
7	69	57	64
8	80	70	60

$$* B_j = \left[(X_j + M_j) - |X_j - M_j| \right] / (X_j + M_j) \cdot 100$$

Source: Greenaway, D. and Milner, C. 'On the Measurement of Intra Industry Trade', Economic Journal, Vol. 93, December 1983, pp.900-908.

54 Finger, J.M. 'Trade Overlap and Intra Industry Trade', Economic Inquiry, Vol. 13, pp.581-89.

55 See Source for Table 2.6, above. For further evidence see Gray, op. cit.

Clearly, further disaggregation to the 7th digit level of the SITC would have resulted in a substantial fall in the proportion of intra industry trade in total trade. Grubel and Lloyd⁵⁶ measured the proportion of intra industry trade between Australia and its major trading partners, and discovered that it fell from 20.2% at the three-digit level to 6.2% at the seven-digit level.

The selection of the seven-digit level is, however, as arbitrary as the selection of the three-digit level of the SITC. The seven-digit level does not correspond in any real sense to the theoretical concept of an industry which underlies intra industry trade theory. The fall may, therefore, reflect either categorical aggregation or the allocation of goods with the same factor proportions to different seven-digit commodity groups⁵⁷.

Normalisation. Whilst the period since EC formation has been characterised by a substantial increase in the proportion of intra industry trade in the total trade between the EC(6) in manufactured goods, the proportion of intra industry trade in the total trade of most of the developed countries has also risen⁵⁸. This increase may reflect the general incidence of trade liberalisation, the impact of the Kennedy Round and the formation of EFTA, or it may suggest that

56 Grubel and Lloyd, op. cit.

57 In appendix 2 the impact of disaggregation is investigated within the context of UK trade with the EC(6) in textile and leather machinery (SITC 717). Disaggregation results in a fall in the proportion of intra industry trade. However, a substantial proportion of intra industry trade remains at low levels of aggregation. Thus disaggregation from the four- to the six-digit level of the NIMEXE results in a fall in the proportion of intra industry trade from 67.13% to 52.42% in 1970/71.

58 Grubel and Lloyd, op. cit., estimated the change in the proportion of intra industry trade in the total trade of Canada, US, Japan, UK and the EC(6) between 1959 and 1967. Canada and Japan exhibited the biggest increases.

factors which are unrelated to trade liberalisation underlie the general increase in intra industry trade between the developed countries. In either case the impact of EC formation and the first enlargement on intra industry trade will be overstated unless the estimates are corrected for the general increase in intra industry trade.

Grubel and Lloyd attempted to overcome this problem by comparing the share of the increase in total manufactured trade between the EC(6) accounted for by intra industry trade, with the share of intra industry trade in the increase in total trade between the EC(6) and all other countries. This approach is open to a number of criticisms.

In the first case Grubel and Lloyd used three-digit data to estimate the share of intra industry trade in the total trade between member countries of the EC(6), and two-digit data to estimate the share of intra industry trade in the total trade between the EC(6) and all other countries. This implies that the results are not strictly comparable. In addition, the Common External Tariff fell by 35% between 1962 and 1972⁵⁹ as a consequence of the Kennedy Round. This suggests that the difference between the share of intra industry trade in the increase in trade between the EC(6), and between the EC(6) and all other countries, will understate the impact of trade liberalisation. Finally, the inclusion of developing countries within all other countries, is open to question since different factors appear to underlie the trade between the developed countries

⁵⁹ See Sazanami and Hamuguchi, op. cit.

and between the developed countries and the developing countries⁶⁰.

Sazanami and Hamuguchi have attempted to overcome the latter problem by comparing the proportion of intra industry trade in the trade of each of the original members of the EC(6) with the EC(6) and a sample of advanced industrial countries.

In contrast Kreinen⁶¹ makes no attempt to normalise his estimates of intra industry trade. The extent to which the observed increase in intra industry trade can be explained by the formation of the EC, its enlargement, general trade liberalisation, or factors which are unrelated to trade liberalisation, cannot therefore be deduced.

Conclusion

The discussion in this chapter suggests that any attempt to estimate the impact of EC enlargement on UK trade flows must incorporate three factors in the derivation of a satisfactory ante-monde:

1. The long-term decline in the UK's share of world manufactured exports.
2. The relationship between changes in the UK's share of world manufactured exports and the business cycle.
3. Changes in both price and non-price competitiveness; in particular the accelerated decline in non-price competitiveness which occurred during the seventies.

60 See Steinherr and Runge, op. cit.

61 Kreinen, op. cit.

This survey of recent estimates of the effects of UK entry into the EC on UK trade flows has shown that none of the existing studies incorporated each of the three factors. Thus Morgan failed to take account of the cyclical effect, while neither Morgan, nor Daly, nor Fetherston, Moore and Rhodes allowed for the decline in non-price competitiveness. This implies that the studies underestimate the positive effects of UK entry into the EC on UK exports, and overestimate the increase in EC export penetration of the UK market. The studies also produced widely differing estimates of the EC effect. It was argued that this divergence was largely a product of different underlying assumptions with respect to the supply, price and demand elasticities.

Whilst the aggregate studies produce widely differing estimates of the net effect of UK entry into the EC on the UK balance of payments, the studies do suggest that UK entry has resulted in a substantial increase in both the total trade in manufactured goods with the EC(6), and in UK manufactured exports to the EC(6). These results are supported, at the sectoral level, by Daly.

Earlier studies of the formation of the EC suggest that this growth in trade between the UK and the EC(6) may take the form of an increase in intra industry trade and specialisation rather than inter industry trade and specialisation. The study by Kreinen appears to provide some support for this contention.

However, three problems which cloud these results, and which must be overcome before satisfactory estimates of the impact of UK entry into the EC on intra industry trade and specialisation can be obtained, were highlighted and discussed:

1. The effect of an overall trade imbalance
2. Categorical aggregation
3. Normalisation.

Finally, the discussion of the disaggregated studies suggests that little attempt has been made to explain the impact of UK entry into the EC on the pattern of UK trade with the EC(6) at the industry level. The study by Daly was descriptive in character and was carried out at the sectoral, rather than the industry, level. Owen was unable to explain the pattern of UK trade with the EC(6) using a model based on the theory of factor proportions. In addition, this study was limited to the period between 1970 and 1975.

PART 2

**The Penetration of EC(6) Markets by UK
Manufacturing Industry: A Test of the
Traditional Theory of Customs Unions**

CHAPTER 3

Import Penetration: The Model

This chapter describes the approach used in this study to analyse the impact of UK entry into the EC on the penetration of EC(6) markets by UK manufacturing industry.

In order to test the explanatory power of the traditional theory of customs unions, inter industry differences in the change in penetration of EC(6) market by UK manufacturing industry are analysed in the context of a multivariate model, derived from the traditional theory of customs unions outlined in chapter 1. The analysis is based on 93 three-digit SITC (Standard International Trade Classification) commodities.

This is the first attempt to explain the impact of UK entry into the EC on the penetration of EC markets by UK manufacturing industry in a disaggregated study, using a multivariate model derived from the theory of customs unions. As noted in chapter 2, previous studies have concentrated either on the estimation of the welfare effects of the customs union¹, or on the net effect of UK entry into the EC on UK trade flows, either for manufacturing industry as a whole²,

1 The attempts to measure the welfare effects of the formation of the EC are reviewed in Mayes, D.G. 'The Effects of Economic Integration on Trade', Journal of Common Market Studies, Vol. XVII, No. 1, September 1978, pp.1-25, and Sellekaerts, W. 'How Meaningful are Empirical Studies on Trade Creation and Diversion?', Weltwirtschaftliches Archiv, Vol. 28, No. 4, December 1973, pp.519-53.

2 See chapter 2, p.31.

or at the sectoral level³.

The model is outlined in the first section of the chapter. The specification and measurement of each of the component variables is then discussed, at length, in the second section.

Section I - The model

The discussion of customs union theory in chapter 1 suggested that the change in the penetration of EC markets by UK manufacturing industry will be positively related to the degree of comparative advantage⁴ and the height of the Common External Tariff (CET)⁵ in the pre-entry period. It will be negatively related to the height of non-tariff barriers⁶. Two additional variables are included in the estimated model. The change in total imports into the EC(6) of the i^{th} commodity is included in order to test whether the UK has performed better in fast or slow growing EC markets. A dummy variable representing industry type, Heckscher-Ohlin, or product cycle, is included in order to test in which type of industry the UK has performed best in the EC(6) market in the post-entry period. The basic model is shown in equation 3.1:

3 See chapter 2, p.31.

4 See chapter 1, p.18.

5 See chapter 1, p.18.

6 See chapter 1, p.18.

$$\text{Equation 3.1 : } PI_i = f(RCA_i, TEC_i, NTB_i, ECG_i, H_i)$$

where:

PI_i = the change in the share of EC(6) imports
of the i^{th} commodity, imported from the UK

RCA_i = the comparative advantage of the UK in the
 i^{th} commodity

TEC_i = the height of the Common External Tariff
on the i^{th} commodity

NTB_i = the height of non-tariff barriers to
trade in the i^{th} commodity

ECG = the change in total imports into the EC(6)
of the i^{th} commodity

H = a dummy variable representing industry type,
Heckscher-Ohlin or product cycle.

The analysis is based on two-year averages for the periods 1970/71 and 1978/79. The performance of the UK in the post-entry period, 1978/79 is, therefore, compared with its performance in the pre-entry, or base, period, 1970/71. Two-year annual averages are used to reduce the impact of random influences on trade flows. Whilst the UK joined the EC in January 1973, 1972 was excluded as a base year because UK trade in 1972 was probably substantially affected by the anticipation effect. The impact of EC enlargement on the penetration of EC markets by UK manufacturing industry would, therefore, be understated if 1972 was used as a base year.

The choice of 1970/71, as the base period, does raise some difficulties. The Kennedy Round multilateral tariff reductions were not fully implemented until 1972. Thus the change in the pattern of UK

trade which took place after 1970/71 may reflect, in part, the impact of the Kennedy Round rather than the entry of the UK into the EC.

This problem may be compounded by lags in the response of trade flows to changes in the tariff structure⁷.

The selection of the post-entry period 1978/79 was based on three factors:

1. The post-entry tariff changes were implemented over the five-year period between 1973 and 1977 (see Table 3.1). 1978 represents, therefore, the first post-entry year after the removal of inter partner tariffs.

Table 3.1 The Timing of Mutual Tariff Dismantling (Percentages)

	<u>Cut</u>	<u>Total Cut</u>
1.4.1973	20	20
1.1.1974	20	40
1.1.1975	20	60
1.1.1976	20	80
1.7.1977	20	100

Source: Cabinet Office 'The United Kingdom and the European Communities', Cmnd 4715, HMSO, London, 1971, para. 79

2. The period 1978/79 precedes the implementation of the Tokyo Round on 1st January 1980.
3. In order to minimise the impact of cyclical effects on import penetration and the pattern of UK trade, the pre- and post-entry periods should lie on equivalent points on the trade

⁷ Kravis, I.B. and Lipsey, R.E. 'Prices and Market Shares in the International Machinery Trade', Review of Economics and Statistics, Vol. LXIV, No. L, 1982, pp.110-116, suggest that the effect of a change in relative prices may take five years to unfold. Hitiris, T. and Petoussis, E. 'Price and Tariff Effects in a Dynamic Specification of the Demand for Imports', Applied Economics, Vol. 16, 1984, pp.15-24, have highlighted substantial differences between short-run price-tariff elasticities and long-run price-tariff elasticities.

cycle⁸. Clearly this requirement poses some difficulties, since the level of economic activity and the pattern of trade in the post-enlargement period were dramatically affected by the oil crises of 1973 and 1979⁹. The annual percentage changes in an index of gross domestic product, (GDP), for the EC and the UK are shown in Table 3.2.

Table 3.2 Annual Changes in GDP, 1970-1981 (Percentages)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
W. Germany	6.0	3.3	4.2	4.5	0.7	-1.6	5.4	3.1	3.1	4.1	1.9	0.2
France	5.7	5.4	5.9	5.4	3.2	0.2	4.9	3.1	3.3	3.2	1.3	0.2
Italy	5.3	1.6	3.2	7.0	4.1	-3.6	5.9	1.9	2.7	4.9	3.9	-0.2
Holland	6.7	4.3	3.4	5.7	3.5	-1.0	5.3	2.4	2.7	2.1	0.9	-1.2
Luxemburg	1.6	4.1	6.2	10.8	3.6	-6.1	1.9	0.6	4.5	4.0	1.7	-1.8
Belgium	5.4	3.9	5.3	6.2	4.4	-1.9	5.7	0.7	3.0	2.4	3.0	-1.8
UK	2.2	2.7	2.2	7.5	-1.0	-0.7	3.6	1.3	3.7	1.6	-2.0	-2.0
EC(10)	5.0*	3.5*	4.1	5.9	1.7	-1.2	5.0	2.7	3.2	3.3	1.3	-0.4

* EC(9) - excludes Greece

Source: Eurostat Review 1970-1979 and 1972-1981

It was decided that, of the four post-entry years after the full implementation of the tariff reduction for which data were available, 1978/79 would provide the best period for comparative purposes. 1980 and 1981 were excluded because of the slow growth in GDP in 1980/81 relative to 1970/71.

8 For a discussion of this point see chapter 2, pp.34-35.

9 See Connell, D. 'The UK's Performance in Export Markets: Some Evidence from International Trade Data', Discuss Paper 6, NEDO, for a discussion of the impact of the oil crisis of 1973 on the pattern of UK exports.

The sample. The analysis is based on 93 three-digit SITC commodities drawn from the manufacturing sector, sections five to eight of the SITC. Lower levels of aggregation were ruled out by the absence of a satisfactory available data source and the difficulties of collection and computation which analyses at the four- or five-digit level of the SITC would have imposed.

During the period covered by this study, 1970-1979, the first revision of the SITC was replaced by the second revision. The 102 three-digit commodities within the manufacturing sector, sections five to eight of the SITC, were reclassified into 154 three-digit commodities. The second revision was implemented in 1977.

To the extent that the second revision reflects the changing pattern of world trade, it may have been preferable to use it as the basis of the analysis. However, it was decided to use the first revision in order to keep the computational task within manageable limits. Even so, the computational task was substantial, since the 154 three-digit commodities of the second revision had to be reclassified into the 102 commodities of the first revision. The reconciliation is presented in Appendix 1.

Nine SITC three-digit commodities were excluded from the analysis. SITC commodity groups 521 (mineral tar and crude chemicals from coal, petroleum and natural gas), 841 and 842 (clothing) were omitted because of the problems of reconciling the first and second revisions of the SITC. 515 (radio-active and associated materials), 571 (explosives and pyrotechnic products) and 688 (uranium and thorium and their alloys) were excluded because of data deficiencies and omissions arising from security considerations. 667 (pearls) was

excluded because of the importance of re-exports in total trade in the commodity. 896 (works of art, collector's pieces and antiques) was excluded because of the non-manufacturing nature of the product, and 897 (jewellery and gold-/silversmiths' wares) was excluded because of the rapid fluctuation in the gold price in the period under consideration.

For any particular trade flow data could have been obtained, either from the importing country or the exporting country. Three factors were taken into consideration when deciding which sources of data to use:

1. Imports are usually valued 'cost, insurance, freight' (cif), and exports 'free on board' (fob). If a given trade flow is measured using import and export data, the import value will be higher than the export value. This suggests that trade flows should be measured either cif, or fob, using either import, or export, data.
2. Export statistics tend to be substantially more inaccurate than import statistics, since tariffs are levied on imports.
3. The UK uses country of consignment as the basis for the collection of trade data, while most other countries use final destination or country of origin¹⁰. Use of country of consignment may have the effect of artificially inflating the importance of the EC as a component of UK trade flows, since UK exports and imports may be routed through the EC(6). In this case some proportion of the increase in UK trade with

¹⁰ The problems of attributing imports to a particular country source are discussed in Green, R. 'How different methods of country attribution affect trade statistics', Trade and Industry, 21 April 1978.

the EC(6) may reflect a change in the routing of UK exports, rather than a change in final destination.

The impact of these effects on estimated UK trade flows for manufacturing industry (SITC 5-8) are shown in Table 3.3.

Table 3.3 The Impact on UK Trade Flows of the Method of Estimation
(in 000s)

	1970/1971			1978/1979		
	1	2	1-2	3	4	3-4
	<u>Export Data</u>	<u>Import Data</u>		<u>Export Data</u>	<u>Import Data</u>	
UK→EC(6)	7264479	6893914	370565 5.10%	35935484	34153457	1782027 4.96%
EC(6)→UK	5868649	6552990	-684341 -11.66%	44758659	46512923	-1607060 -3.78%

Source: Based on data obtained from OECD Series C, various editions

The table provides two estimates of each trade flow using both import and export data. Thus in 1970/71 UK exports to the EC(6) were 5.10% higher if UK export data valued fob were used, rather than EC(6) import data valued cif. Similarly, in 1978/79 UK exports to the EC(6) were 4.96% higher if UK export data rather than EC(6) import data were used. This suggests that the difference in valuation, cif or fob, is considerably smaller than the bias imported by the use of country of consignment rather than country of origin, or destination: a conclusion which is supported by the estimates for EC(6) exports to the UK in 1970/71.

In the light of these results it was decided, where possible, to use EC(6) import and export data. This decision has the disadvantage that imports will tend to be overestimated relative to exports, since imports are measured cif whilst exports are measured

fob. In addition, as mentioned, export data tend to be more inaccurate than import data. It was felt, however, that the use of either EC(6) and UK exports, or EC(6) and UK imports, in order to measure trade flows, either cif or fob, would have resulted in a larger source of bias, since the UK data would have been based on country of consignment, whilst the EC(6) data would have been based on country of origin. Similarly, in those cases where UK trade flows with Canada, Japan and the USA enter the analysis, the import and export data of each of these countries are used, rather than UK data.

Finally, OECD trade data are stated in current values. The data were adjusted for inflation using the price index published in the Eurostat Revue. The relevant values for the index are shown in Table 3.4.

Table 3.4 The Price Index (1975 = 100)

	<u>1970</u>	<u>1971</u>	<u>1978</u>	<u>1979</u>
USA	72.1	75.8	119.3	129.6

Source: Eurostat Revue 1970-1979, Luxemburg, 1980

Section II - Specification and measurement of the dependent and independent variables

The dependent variable (PI_1). Before an adequate measure of the impact of UK entry into the EC on the UK's share of the i^{th} EC(6) market can be obtained, two problems must be considered - firstly, the definition of the market, and secondly, normalisation, adjustment of the change in the UK share of the i^{th} EC(6) market after entry, in order to compensate for changes in the UK's share of the EC(6) market which would have occurred in the absence of UK entry into the EC.

According to the discussion in chapter 1, UK exports of the i^{th} commodity to the EC(6) might be expected to increase, both because of the trade diversion effect as UK exports are substituted for non-partner imports, and as a consequence of trade creation¹¹. Both a production effect as UK exports are substituted for home production, and a consumption effect as demand increases in response to the cut in price, can be isolated. If the full effect of UK entry into the EC on the change in the UK share of the i^{th} EC(6) commodity market is to be calculated, the market should be defined as the sum of total imports of the i^{th} commodity into the i^{th} EC(6) commodity market, plus home production, less exports.

However, it was decided not to include home production within the market definition because of the absence of a satisfactory data source. Whilst a common industrial nomenclature for the member states has been derived by the EC, the General Industrial Classification of Economic Activities (NACE), two problems precluded its use in this study. Firstly, the size of the data collection and computation exercise involved was substantial. Satisfactory reconciliation of NACE and the SITC at the three-digit NACE level would have involved the allocation of 894 five-digit SITC commodity headings to 93 NACE manufacturing industries. A satisfactory reconciliation could not be derived using three-digit NACE and SITC data. Secondly, whilst the EC has collected industry statistics on an annual basis within the NACE classification since 1973, a satisfactory data base is only available from 1975¹². Thus the data could not, in any case, have

11 See chapter 1, p.17.

12 See The Structure and Activity of Industry: Coordinated Annual Inquiry into Industrial Activity in the Member States. Methods and Definitions, Luxembourg, 1979, for a detailed discussion of the limitations of this source of data.

been used for comparative purposes over the period 1970/71-1978/79.

Even if a satisfactory reconciliation of the trade and industry classifications could have been generated, two statistical problems would appear to cast doubt on the interpretation of changes in the dependent variable through time:

1. Double counting. Two varieties can be isolated, industry/industry and trade/industry. Industry/industry double counting will occur because of the resale of products within the industry, where the output of the i^{th} product may be counted in the sales of more than one company. Trade/industry double counting will appear when manufacturers resell goods which are produced abroad. Thus the i^{th} product may appear both as an import and in the sales of a company in the same market.
2. Calculation of manufacturers' sales. Manufacturers' sales may be equated either with the total sales of firms classified to the industry, which will usually include the sales of some other products, or with the sales of the principal products of the industry, which will include sales of the same product made by firms classified to other industries.

Both problems may invalidate cross-industry comparisons of the import penetration ratio, since the extent of the problems may differ, both between industries and through time¹³.

In the light of this discussion, the dependent variable, before

13 For a detailed discussion of the problems of reconciling the trade and industry nomenclatures, see Wells, J.D. and Imber, J.C. 'The Home and Export Performance of United Kingdom Industries', Economic Trends, August 1977.

normalisation, was defined as the change in the UK's share of total EC(6) imports of the i^{th} commodity between 1970/71 and 1978/79 (Equation 3.1).

Equation 3.2

$$\text{PIEC}_i = \left(\frac{(\text{EC}(6)M_{i\text{UK}}/\text{EC}(6)M_{i\text{W}})_{1978/79} - (\text{EC}(6)M_{i\text{UK}}/\text{EC}(6)M_{i\text{W}})_{1970/71}}{(\text{EC}(6)M_{i\text{UK}}/\text{EC}(6)M_{i\text{W}})_{1970/71}} \right)$$

where:

EC(6) = France, Belgium, Luxemburg, West Germany, Italy
and Holland

M = imports

UK = United Kingdom

W = world

i = commodity groups 1 - 93

The omission of home production, less exports, from the dependent variable introduces the implicit assumption that the domestic consumption of home production has remained a constant proportion of the EC(6) market during the period under consideration. This assumption will clearly be invalid if UK entry into the EC has resulted in trade creation as well as trade diversion. However, three-quarters of the total imports of manufactured goods into the EC(6) were traded free of duty in 1972¹⁴. This implies that the scope for trade creation after UK entry into the EC was limited, and provides some support for the omission of home production from the specification of the dependent variable.

14 See Morgan, A.D. 'The Balance of Payments and British Membership of the European Community' in Wallace, H. (ed.) Britain in Europe, Heinemann, 1980, p.69.

Normalisation. The change in the penetration ratio between 1970/71 and 1978/79 will be the sum of two components: PIT, the change in penetration which would have occurred in the absence of UK entry into the EC, and PIE, the change in the penetration ratio which occurred as a consequence of UK entry into the EC. This implies that estimates of the ante-monde must be obtained in order to calculate the change in penetration which occurs as a consequence of UK entry into the EC.

Estimation of the ante-monde introduces two distinct questions. Firstly, what legal and institutional adjustments would have been made to the framework of international trade if the UK had not entered the EC? Thus the ante-monde could be based on a series of alternative scenarios which might include: the formation of an EFTA-EEC free trade area, the implementation of a new set of multilateral tariffs, or the strengthening of trade links with the Commonwealth. The performance of the UK in EC markets, in the absence of entry, would clearly have depended on the alternative trade arrangements negotiated. However, the choice of an alternative scenario is open to speculation, and the estimation of the impact of alternatives lies outside the scope of this study. In this study a comparison is drawn between the performance of the UK after entry into the EC, and its performance if it had not entered the EC, but all other trading arrangements remaining constant. Secondly, which method should be used to compute the ante-monde?

The existing methods of estimating the ante-monde have been extensively reviewed in chapter 2. In this case the method selected was largely determined by the disaggregated nature of the study and by three factors which underlie the pattern of UK trade in the post-war

15 See chapter 2, pp.32-51.

period. Each of these factors was discussed in chapter 2. They are: firstly, the decline in UK non-price competitiveness, a trend which accelerated in the post-enlargement period¹⁶. Secondly, the long-term decline in the UK's share of manufactured goods markets¹⁷. Thirdly, the tendency for the UK to maintain its share of world markets during periods of world recession¹⁸.

Three methods of estimating the ante-monde were considered:

1. The specification and estimation of a trade model. This could be based either on the gravitational model, or on a set of import demand functions.
2. The estimation of hypothetical import shares under the assumption that the pre-entry trend in the EC market could be extrapolated into the post-enlargement period or, alternatively, on the basis that market shares would have remained constant in the absence of integration.
3. Estimation of the change in UK import penetration in markets where there were no preferential tariff changes, as a control with which to compare actual changes in the penetration of EC markets by UK manufacturing industry.

The third method was selected as the basis of the analysis in this study. This method is based on a hypothesis introduced by

16 See chapter 2, pp.46-48.

17 See chapter 2, p.34.

18 See chapter 2, p.34.

Lamfallussy¹⁹ and developed by Williamson and Bottrill²⁰. It states that 'the share performance of the j^{th} supplier in markets where he neither gains nor loses preferential advantage gives a good indication of his hypothetical performance in markets which were in fact being affected by integration'²¹. The normalised version of the dependent variable is obtained by subtracting the change in the UK's share of the total imports of the i^{th} commodity, into a market in which there were no preferential tariff changes, from the change in the UK's share of total EC imports of the i^{th} commodity during the period between 1970/71 and 1978/79.

The combined import market of Canada, the USA and Japan was used as the third country, or control market. Thus the change in the UK's share of the i^{th} commodity market in Canada, the USA and Japan between 1970/71 and 1978/79 was used as a measure of UK performance in the EC in the absence of UK entry into the EC.

These three countries were selected for two reasons:

1. Each of the three countries is an advanced industrial nation.

The market is, therefore, comparable to the EC market and could be expected to import goods of a similar quality and type. Other industrial countries were considered but they were excluded, either because they were former partners in EFTA, or because they received preferential treatment as Commonwealth countries. It was decided not to include

19 Lamfallussy, A. 'Intra-European Trade and the Competitive Position of the EEC', Manchester Statistical Society, 13th March 1963.

20 Williamson, J. and Bottrill, A. 'The Impact of Customs Unions on Trade in Manufactures', Oxford Economic Papers, Vol. 23, No. 3, November 1971, pp. 323-351.

21 Ibid., p.333.

advanced developing countries or third world countries in the control group, since different factors might underlie UK competitiveness in advanced industrial and other markets. In this case the performance of the UK in third world or advanced developing countries would not provide a good predictor of UK performance in the EC in the absence of UK entry.

2. The combined import market formed by the USA, Japan and Canada (RW3) was comparable in size to the EC(6) in 1970 (Table 3.5). In addition the RW3 and the EC(6) imported a similar proportion of goods in each of the one-digit SITC sections which comprise manufactured imports.

Table 3.5 Manufactured Imports into the EC(6) and the RW3 in 1970 (000 \$s)

SITC Code	EC(6) 1970	RW3 1970
5-8	52601902	42195295
5	5640522	3252835
6	20080371	12340006
7	19846680	19798744
8	7034329	6802710

Source: Based on data obtained from the Yearbook of International Trade Statistics 1970, United Nations, New York, 1971

This technique avoids the problems inherent in the extrapolation of pre-entry trends, such as the dramatic change in world trading conditions which has occurred over the past two decades, and the problems of separating out the impact of trade liberalisation, the Kennedy Round, from the pre-entry trend. The method also

takes account of changes in price and non-price competition in the post-entry period, since these variables will have changed in both the EC and the control market. However, the hypothesis that the performance of the UK in the EC would have been the same as its relative performance in third country markets, had enlargement not taken place, rests on the implicit assumption that rates of growth of GNP and relative competitiveness moved in similar directions in both third countries and the EC. The disaggregated nature of this study will exacerbate this problem, since individual commodities may operate on different cycles in the EC and control markets. Further, the performance of the UK in individual control markets, relative to EC markets, may be affected by changes in non-tariff barriers during the period under consideration.

The method also assumes that the UK has a perfectly elastic export supply elasticity. Thus entry into the EC is assumed not to have affected the ability of the UK to supply non-EC markets. There is no export trade diversion. However, as discussed in chapter 1²², export trade diversion might be expected in the case of UK entry into the EC, since the EC market is large relative to UK trade in each of the commodities. This might imply that the increase in demand from the EC could not be satisfied without the re-direction of UK exports.

If there is export trade diversion, the value of the approach must be open to doubt. The control market and the EC will no longer be independent. Thus a fall in import share in the control market may occur as a consequence of UK entry into the EC, rather than providing a measure of UK performance in the EC in the absence of enlargement.

22 See chapter 1, pp.14, 15 and 17.

However, the bulk of the post-entry period has been characterised by fairly low levels of economic activity within the UK economy²³. This would appear to suggest that any increase in the demand for UK exports from the EC could have been met without the re-direction of exports from other sources to the EC.

Gravitational models and import demand functions²⁴ were effectively ruled out by the disaggregated nature of this study. Estimation of the parameters for each of the 93 commodity groups would have involved a data collection and collation exercise which could not have been carried out within the constraints placed on this study. In addition, a satisfactory measure of the price variable could not be obtained.

Two sources of data were considered, unit values and wholesale price indices. Unit or tonne values are obtained by dividing total imports by the number of units, or tonnes, within disaggregated commodity groups. The disaggregated price indices are then weighted and combined.

However, results generated by Kravis and Lipsey²⁵ suggest that the unit values of manufactured goods, at the seven-digit level, differ between countries of destination.

23 Begg, I. and Rhodes, J. 'Will British Industry Recover?' Cambridge Economic Policy Review, April 1982, Vol. 8, No. 1, pp.18-26.

24 See Mayes, D.G., op. cit.

25 Kravis and Lipsey, op. cit.

These results imply that even highly disaggregated commodity groups include very different products. Thus a change in the tonne or unit value may reflect either a change in price or a change in the commodity composition of the product group. In effect, the unit, or tonne, value fails to distinguish between changes in price and changes in quality, or non-price competitiveness²⁶. This failure is particularly important in the context of this study, since the evidence presented in chapter 2²⁷ suggests that the post-entry period was characterised by a substantial decline in UK non-price competitiveness.

Wholesale price indices were considered as an alternative source of data for the relative price variable. However, wholesale price indices are based on price movements in domestic markets. This implies that products which are not traded internationally may enter the wholesale price index. Further, use of the wholesale price index to measure international competitiveness is based on the implicit assumption that domestic and international prices move together. This assumption is clearly questionable, since the degree of competition and pricing behaviour may differ between domestic and international markets.

Finally, utilisation of the wholesale price index was reliant on the satisfactory reconciliation of the trade and industry nomenclatures and the availability of a satisfactory series of data at a level of aggregation corresponding to the three-digit level of the SITC. Neither of these conditions could be satisfied.

Two variants of the share method were considered: constant shares and the extrapolation of pre-entry trends. The constant shares

26 As noted in chapter 2, pp.46-48, the tonne value may be used as a measure of non-price competitiveness.

27 See chapter 2, pp.46-48.

assumption implies that UK entry into the EC was the only influence on import shares in the period under consideration²⁸. Thus relative prices, non-price competitiveness and the level of demand are either assumed to be constant or independent of share changes. Both assumptions are open to question.

As noted in chapter 2²⁹, the evidence suggests that the UK's share of world trade is inversely related to the growth of world trade. This implies that the constant shares assumption may result in the over-estimation of the increase in penetration, since the post-entry period has been characterised by a reduction in the rate of growth of world trade³⁰. Further, the discussion in chapter 2³¹ highlighted the substantial changes in UK price and non-price competitiveness which have characterised the period since UK entry into the EC. The failure to incorporate the reduction in UK non-price competitiveness in the estimation of the ante-monde may result in the understatement of the beneficial impact of EC entry on UK performance in EC markets³². Finally, the method ignores the continuing impact of long-term trends on UK performance.

The second share method, the extrapolation of pre-entry trends, represents an attempt to incorporate the impact of long-term trends on UK trade performance in the post-entry period. Those factors which underlie the trend in the pre-entry period are assumed to remain

28 For a detailed criticism of the constant shares approach, see Mayes, op. cit.

29 See chapter 2, p.34.

30 Connell, op. cit.

31 See chapter 2, pp.46-48.

32 See chapter 2, p.37.

constant after EC entry. Thus changes in competitiveness and the rate of liberalisation are assumed to continue at the same rate throughout the period of analysis. In effect, the estimated impact of EC entry on UK trade performance in the EC will include the effects of the oil crisis, the depressed level of world trade and the accelerated decline in UK non-price competitiveness. In addition, the climate of world trade liberalisation, which underlies the developing pattern of world trade in the pre-entry period, has not continued during the post-entry period³³.

It was decided not to use extrapolated trends in this study, for two reasons: firstly, because of the data requirements that the estimation of 93 separate trends would have imposed; secondly, the general trend in world trade has changed dramatically between the pre-entry and post-entry periods, invalidating the assumptions which underlie the technique. However, whilst the constant share technique is open to many criticisms, it will be used in the study as a benchmark because it is relatively resource inexpensive.

In the light of this discussion two variants of the dependent variable are used in this study: $PIEC_i$, the unadjusted change in the UK's share of total EC(6) imports of the i^{th} commodity between 1970/71 and 1978/79 (Equation 3.2); and PIA_i , the change in the UK's share of total EC(6) imports of the i^{th} commodity between 1970/71 and 1978/79, less the change in the UK's share of total RW3 imports of the i^{th} commodity between 1970/71 and 1978/79 (Equation 3.3). $PIEC_i$ is based on the implicit assumption of constant shares.

33 These points are extensively discussed in chapter 2, pp. 32-51.

Equation 3.2

$$PIEC_i = \left(\frac{(EC(6)M_{iUK}/EC(6)M_{iW})_{1978/79} - (EC(6)M_{iUK}/EC(6)M_{iW})_{1970/71}}{(EC(6)M_{iUK}/EC(6)M_{iW})_{1970/71}} \right)$$

Equation 3.3

$$PIA_i = \left[\frac{\left(\frac{(EC(6)M_{iUK}/EC(6)M_{iW})_{1978/79} - (EC(6)M_{iUK}/EC(6)M_{iW})_{1970/71}}{(EC(6)M_{iUK}/EC(6)M_{iW})_{1970/71}} \right) - \left[\frac{\left(\frac{(RW3M_{iUK}/RW3M_{iW})_{1978/79} - (RW3M_{iUK}/RW3M_{iW})_{1970/71}}{(RW3M_{iUK}/RW3M_{iW})_{1970/71}} \right)}{(RW3M_{iUK}/RW3M_{iW})_{1970/71}} \right]}{(RW3M_{iUK}/RW3M_{iW})_{1970/71}} \right]$$

where:

EC(6) = France, Belgium, Luxemburg, West Germany, Italy
and Holland

M = imports

UK = United Kingdom

W = world

RW3 = Canada, Japan and the USA

i = commodity 1 - 93

Two additional variants of the dependent variables are also used in the analysis. PEC_i , the unadjusted change in the UK's share of EC(6) imports of the i^{th} commodity from the EC(7) between 1970/71 and 1978/79 (Equation 3.4), and PA_i , the change in the UK's share of EC(6) imports of the i^{th} commodity from the EC(7) between 1970/71 and 1978/79, less the change in the UK's share of RW3 imports of the i^{th} commodity from the EC(7) between 1970/71 and 1978/79 (Equation 3.5).

Equation 3.4

$$PEC_1 = \left((EC(6)M_{iUK}/EC(6)M_{iEC(7)}) - (EC(6)M_{iUK}/EC(6)M_{iEC(7)}) \right) / (EC(6)M_{iUK}/EC(6)M_{iEC(7)})$$

1978/79 1970/71 1970/71

Equation 3.5

$$PA_1 = \left[\left((EC(6)M_{iUK}/EC(6)M_{iEC(7)}) - (EC(6)M_{iUK}/EC(6)M_{iEC(7)}) \right) / (EC(6)M_{iUK}/EC(6)M_{iEC(7)}) \right]$$

$$- \left[\left((RW3M_{iUK}/RW3M_{iEC(7)}) - (RW3M_{iUK}/RW3M_{iEC(7)}) \right) / (RW3M_{iUK}/RW3M_{iEC(7)}) \right]$$

1978/79 1970/71 1970/71

where:

EC(6) = France, Belgium, Luxembourg, West Germany, Italy and Holland

M = imports

UK = United Kingdom

W = world

RW3 = Canada, Japan and the USA

EC(7) = EC(6) plus the United Kingdom.

i = commodity 1 - 93

The independent variables.

Revealed comparative advantage (RCA_i). According to the theory of customs unions, discussed in chapter 1, the degree of comparative advantage in the i^{th} commodity relative to the EC(6) should be positively related to the change in penetration of the i^{th} EC(6) market by UK manufacturing industry³⁴. The degree of comparative advantage, relative to the EC(6), is determined by the relative factor endowments, and hence relative costs, of the UK and the EC(6).

Since relative cost data are not available at the 3-digit level of the SITC, two measures of revealed comparative advantage in the pre-entry period - the trade balance (Equation 3.6) and relative performance in third markets (Equation 3.7) - are used as proxies for the underlying comparative cost conditions.

Equation 3.6

$$RCA_1 = (UKX_{ijt} - UKM_{ijt}) / (UKX_{ijt} + UKM_{ijt})$$

Equation 3.7

$$RCA_2 = (UKX_{ijt} / jX_{ijt})$$

where:

X = exports

M = imports

i = commodity 1 - 93

j = country, group of countries

t = 1970/71

UK = United Kingdom.

³⁴ See chapter 1, p.18.

The trade balance. The trade balance is defined as UK exports of the i^{th} commodity to the j^{th} country or group of countries, minus UK imports of the i^{th} commodity from the j^{th} country or group of countries, divided by the sum of imports and exports. The trade balance is calculated with respect to both the world (RUKW) and the EC(6), (RCEC).

The trade balance tends towards one when the trade balance is favourable, and minus one when the trade balance is unfavourable. Division of the trade balance by the sum of imports and exports permits the comparison of industries, or markets, of different size. The specification also has the advantage of directly linking imports and exports. Two drawbacks can be isolated.

In the first case the trade balance fails to take account of inter industry differences in demand. Thus we can consider an extreme case where country A produces commodity i , but has no demand for it, resulting in a trade balance which will be equal to one regardless of the comparative advantage possessed by country A in the production of the i^{th} commodity. Further, a decline in total demand for the commodity in country A relative to other commodities may be mistaken for an improvement in comparative advantage, since imports will fall whilst exports remain constant.

In the light of these problems it might have been preferable to use domestic consumption of the i^{th} product as the denominator, rather than the sum of imports and exports. The denominator would then have represented an accurate measure of market size, and changes in domestic demand could have been incorporated within the variable. However, inclusion of domestic consumption would have re-introduced the substantial problems inherent in matching the trade and industry

nomenclatures³⁵. It was not, therefore, included within the specification.

The exclusion of domestic consumption does, however, suggest that changes in the trade balance should be treated with caution, particularly if industries move on different cycles in different countries.

The second drawback of the trade balance as a measure of comparative advantage, lies in the relationship between the trade balance and the structure of tariff and non-tariff barriers. Thus the UK trade balance relative to the EC(6) and the world in 1970/71 will be determined by the pattern of tariff and non-tariff barriers, as well as the pattern of comparative advantage. This implies that a negative trade balance between the EC(6) and the UK may reflect the height of EC(6) tariffs relative to the UK in 1970/71, rather than an underlying comparative disadvantage in the production of the i^{th} commodity.

In order to overcome this problem, the trade balance between the UK and the EC(6), and the UK and the world, was adjusted for the height of tariff barriers in 1970/71, using the formula developed by Han and Liesner³⁶ (Equation 3.8).

Equation 3.8

$$z = d \left(\frac{t}{1+t} \right) M$$

where:

z = additional trade between the UK and the j^{th} country, or group of countries, in the absence of tariff barriers

35 See chapter 3, pp.78-79 for a detailed discussion of these problems.

36 Han, S.S. and Liesner, H.H. Britain and the Common Market: The Effect of Entry on the Pattern of Manufacturing Production, Cambridge University Press, 1971.

M = recorded trade flows

t = tariff rate

d = response coefficient.

The estimated value of z is clearly dependent on the response coefficient selected. Following Han and Liesner, values of three and five were used in this study³⁷. The response coefficient is, therefore, assumed to be the same for all commodities. Ideally, separate estimates of the response coefficient for each of the commodities should have been used. Satisfactory data were not, however, available at the three-digit level of the SITC³⁸. The adjusted estimates of the trade balance should, therefore, be treated with caution. The adjusted trade balance is presented in Equation 3.9.

37 Recent results suggest that these values may be rather high. Stone, J.A. 'Price Elasticities of Demand for Imports and Exports: Industry Estimates for the UK, the EEC and Japan', Review of Economics and Statistics, Vol. LXI, No. 2, May 1979, pp.306-16, estimated values of the import price elasticity of demand for the EC, which lie between -1.00 and -0.84. However, Han and Liesner's results suggest that the rank order is fairly insensitive to changes in the response coefficient.

38 Stone, J.A., op. cit., has estimated the import price elasticities of demand of the EEC for 34 commodity groups which include a substantial proportion of manufactured trade. However, the price elasticity is significant, and negative, at the 5% level in only 19 of these groups. Further, these elasticities are based on unit values. And, as noted in chapter 2 pp.46-48, unit values may reflect price or quality.

Equation 3.9

$$RCA_{iz} = \frac{\left[(UKX_{ijt} + ZUKX_{ijt}) - (UKM_{ijt} + ZUKM_{ijt}) \right]}{\left[(UKX_{ijt} + ZUKX_{ijt}) + (UKM_{ijt} + ZUKM_{ijt}) \right]}$$

where:

X = exports

M = imports

i = commodity 1 - 93

j = country, group of countries

t = 1970/71

UK = United Kingdom

Z = additional trade between the UK and the j^{th} country,
or group of countries, in the absence of tariff
barriers.

The adjusted trade balance is calculated with respect to both the EC(6), (RCECZ), and the world, (RUKWZ).

Relative performance in third markets. This variable is defined as UK exports of the i^{th} commodity to the j^{th} country or group of countries, divided by the exports of the j^{th} group of countries of the i^{th} commodity, to the j^{th} country or group of countries (Equation 3.7). Thus UK exports to third country markets are expressed as a proportion of the exports of competitors to third country markets.

This method has the advantage that the measure of revealed comparative advantage will be independent of the UK - EC tariff structure in 1970/71. In addition, the estimates will be independent of industry or market size.

The third country market was defined as Canada, Japan and the USA. These countries were selected because they are advanced industrial countries which might be expected to import goods of a similar range and quality to the EC(6). In addition RCRW3, the relative performance of the UK in third markets, will only provide an accurate measure of revealed comparative advantage if the UK and its competitors face the same tariff structure in the third market. This effectively precluded those advanced industrial countries with which the UK had a preferential tariff agreement in 1970/71³⁹.

UK exports of the i^{th} commodity to Japan, Canada and the USA are expressed as a proportion of EC(6) exports to Canada, Japan and the USA. The final form of the variable is expressed in Equation 3.10.

Equation 3.10

$$\text{RCRW3} = (\text{UKX}_{i\text{RW3}t} / \text{EC}(6)\text{X}_{i\text{RW3}t})$$

where:

X = exports

M = imports

i = commodity 1 - 93

j = country, group of countries

t = 1970/71

UK = United Kingdom

EC(6) = Belgium, France, Luxemburg, Italy, Holland, West
Germany

RW3 = Canada, Japan, USA

39 In particular EFTA, Australia, Canada.

Tariffs (TEC_1). The discussion of customs union theory in chapter 1 suggests that the change in the penetration of EC(6) markets by UK manufacturing industry after UK entry into the EC will be positively related to the height of the Common External Tariff (CET) in 1970/71.

The tariff variable was calculated as the unweighted average of the eight-digit Brussels Tariff Nomenclature (BTN) headings, aggregated within three-digit SITC commodity groups⁴⁰.

These estimates may be biased in either direction, since this procedure does not reflect the relative importance of different BTN eight-digit commodities within each three-digit SITC heading⁴¹.

Whilst it would have been possible to overcome this problem by weighting each of the eight-digit BTN headings by its share of total trade within each three-digit SITC commodity group, this procedure was rejected. It would have involved a substantial computational task and would probably have resulted in a set of tariffs which are biased downwards, since the level of tariffs may be negatively related to the size of the trade flow.

Specification of the tariff variable introduced two additional problems. Firstly, the evidence presented in chapter 2⁴² suggests that the full impact of a change in tariffs on trade flows will only be felt with a four or five year lag. This implies that the post-entry period

40 The International Customs Journal: Customs Tariffs of the European Communities, International Customs Tariffs Bureau, Brussels, 1971.

41 For a detailed discussion of this point see Hinshaw, R. The European Community and American Trade: A Study in Atlantic Economics and Policy, New York, Praeger, 1964.

42 See chapter 2, p.40.

of analysis, 1978/79, may be too early to pick up the full effects of UK entry into the EC on the pattern of trade, since the process of tariff adjustment was not completed until 1.7.1977. In this case, inter industry differences in the penetration of EC(6) markets by UK manufacturing industry will reflect inter industry differences in the lag structure, as well as the height of the CET in 1970/71. In the absence of data on inter industry differences in the lag structure, this problem could only have been overcome by selecting a later period for comparative purposes. This option was precluded by the considerations outlined on p.73.

Secondly, the change in the penetration of EC(6) markets by UK manufacturing industry after UK entry into the EC will be a function not only of the reduction in intra EC tariffs, but also the price tariff elasticity of the i^{th} commodity. Satisfactory estimates of the price tariff elasticity of demand could not, however, be obtained at the three-digit level of the SITC. Since omission of the price tariff elasticity from the estimated equation introduces the implicit, and unreasonable, assumption that the elasticity is the same for each commodity⁴³, a second version of the tariff variable, ETEC, is defined.

In order to obtain this variable the sample was divided into two groups of products, manufactures and semi-manufactures. Separate price elasticities were obtained for each of the product groups⁴⁴, and the variable was formed by multiplying the CET in the i^{th} industry by the relevant price elasticity of demand.

43 For evidence of substantial inter commodity differences in the import price elasticity of demand see Stone, op. cit.

44 The price elasticities of -1.1 for finished manufactures and -1.7 for semi-manufactures were obtained from Morgan, op. cit.

Growth of the EC(6) market (ECG_i). This variable is defined as the percentage change in total EC(6) imports of the i^{th} commodity between the base period 1970/71 and the post-entry period 1978/79 (Equation 3.11). Ideally, the variable should have been specified as the growth in consumption of the i^{th} commodity in the EC(6) market. This specification was precluded by the problems of reconciling the trade and industry nomenclatures at the three-digit level of the SITC. Domestic consumption of home production has, therefore, been omitted from the specification.

Equation 3.11

$$ECG_i = \left[\frac{(EC(6)M_{iW} \text{ 1978/79} - EC(6)M_{iW} \text{ 1970/71})}{(EC(6)M_{iW} \text{ 1970/71})} \right]$$

where:

EC(6) = France, Belgium, Luxemburg, Italy, Holland, West
Germany

W = world

i = commodity 1 - 93

M = imports.

The variable is included in order to discover whether the UK has performed better in fast or slow-growing EC(6) markets.

If UK entry into the EC has resulted in trade creation in the i^{th} EC(6) market, both the production effect and the consumption effect will result in an increase in total imports into the i^{th} EC(6) market⁴⁵. In this case the growth of the EC(6) market should be positively related to the change in penetration of the i^{th} EC(6) market by

45 For a detailed discussion of this point see chapter 1, pp.10-12.

UK manufacturing industry. However, the i^{th} EC(6) market may grow for a variety of reasons which are unrelated to EC(6) enlargement. These factors may swamp the effects of trade creation, since UK entry into the EC should only have resulted in a small increase in imports, as a consequence of trade creation, in EC(6) markets⁴⁶.

In the light of this discussion it was decided that the sign on this variable could not be predicted a priori.

Non-tariff barriers (NTB_i). Two types of NTB are considered within this section: legal and institutional barriers to trade, and transport costs.

The legal and institutional barriers to trade can be divided into two groups: external NTBs which discriminate against the importation of commodities from non-member countries, and internal NTBs which discriminate against imports from other member countries as well as non-member countries.

The discussion of customs union theory in chapter 1⁴⁷ suggests that the change in the penetration of the i^{th} EC(6) market by UK manufacturing industry will be negatively related to the height of internal NTBs in 1970/71, and the change in the height of internal NTBs since UK entry into the EC. An increase in the height of external non-tariff barriers will result in trade diversion from non-member to member countries. In this case the change in the penetration of the i^{th} EC(6) market by UK manufacturing industry will be positively related to the change in the height of external NTBs since UK entry into the EC.

46 See chapter 2, p.41, and Morgan, op. cit.

47 See chapter 1, p.18.

Specification of the non-tariff barrier variable was hampered by the absence of a satisfactory data base. The quality of the available data precluded the definition of continuous variables, or the separation of changes in internal and external tariffs⁴⁸.

The specified variable is based on data developed by Page. Those three-digit SITC commodity groups which Page defined as managed were given a value of one, and all other industries zero. To the extent that the variable reflects the imposition of external non-tariff barriers, a positive relationship between NTB and the dependent variable is expected. To the extent that the variable reflects the imposition of internal non-tariff barriers, a negative relationship between NTB and the dependent variable is expected.

According to the discussion in chapter 1, the second type of non-tariff barrier, the cost of transporting the i^{th} commodity, should be negatively related to the change in the penetration of the i^{th} EC(6) market by UK manufacturing industry. However, since results provided by Edwards⁴⁹, and Bayliss and Edwards⁵⁰ suggest that transport costs form a very small proportion of the final sales price of manufactured goods, this variable was excluded from the analysis.

Industry type (Hi). This variable was obtained by dividing the three-digit SITC commodity groups into Heckscher-Ohlin product cycle and Ricardo goods, following the classification developed by Hufbauer. This variable was included in order to test in which type of industry the UK has performed best in the EC(6) market in the post-entry period.

48 Available sources included Page, S.A.B. 'The Revival of Protectionism and its Consequences for Europe', Journal of Common Market Studies, Vol. XX, No. 1, September 1981, and Walter, I. 'Non Tariff Protection Among Industrial Countries: Some Preliminary Evidence', Economia Internazionale, No. 2, 1972, pp.335-55.

49 Edwards, S.L. 'Transport Cost in British Industry', Journal of Transport Economics and Policy, September 1970, pp.265-77.

50 Bayliss, B.T. and Edwards, S.L. Industrial Demand for Transport, HMSO, 1970.

CHAPTER 4

Import Penetration: the Results

In this chapter the regression results of the multivariate model of import penetration, developed in chapter 3, from customs union theory, are presented and discussed.

The chapter is divided into three sections. The ability of the model to explain changes in the UK share of total imports into the i^{th} EC(6) commodity market is investigated in section I. The ability of the model to explain changes in the UK share of imports from the EC(7) into the i^{th} EC(6) commodity market is investigated in section II. The results presented in sections I and II provide little support for the model. The factors which may underlie the poor performance of the model are discussed in section III.

Section I - The Determinants of the Change in the UK Share of Total Imports into the i^{th} EC(6) Commodity Market

The regression estimates of the determinants of the unadjusted change in the UK share of total imports into the i^{th} EC(6) commodity market, (PIEC)¹, are presented in Table 4.1².

The degree of explanation provided by the model is not high. R^2 , the coefficient of determination, lies between 0.01 and 0.31. The F statistic is, however, significant at the 1% level in six out of the nine equations estimated.

1 For a detailed discussion of the specification of this variable, see chapter 3, pp.77-81.

2 SITC 561 (Manufactured Fertilisers) was excluded from the initial sample of 93 manufacturing commodities throughout the regression analysis. The commodity group accounts for a very small proportion of UK exports to the EC(6), 0.22%, but acts as a substantial outlier.

Table 4.1 Regression Analysis: the Determinants of the Change in the UK Share of Total Imports into the 1st EC(6) Commodity Market (PIEC) n = 92

DV	Const.	RCEC	RCRW3	RUKW	TEC	ECG	H	NTB	R ²	F Stat.
PIEC	0.40 (0.52)	-0.83 (0.24)*							0.28	34.90*
PIEC	0.37 (0.61)		-0.27 (1.23)						0.01	0.05
PIEC	0.49 (0.56)			-0.63 (0.15)*					0.16	16.61*
PIEC	0.54 (0.52)	-0.88 (0.14)*			0.01 (0.02)	-0.14 (0.08)	-0.05 (0.11)		0.31	9.68*
PIEC	0.40 (0.62)		-0.33 (1.27)		0.01 (0.03)	-0.09 (0.10)	0.09 (0.13)		0.01	0.29
PIEC	0.50 (0.55)			-0.75 (0.16)*	0.02 (0.02)	-0.17 (0.09)	0.25 (0.12) [†]		0.21	5.85*
PIEC	0.45 (0.50)	-0.83 (0.14)*			0.01 (0.02)	-0.08 (0.08)	-0.14 (0.11)	0.40 (0.14)*	0.37	10.10*
PIEC	0.26 (0.59)		0.49 (1.22)		0.01 (0.03)	-0.01 (0.10)	-0.04 (0.13)	0.50 (0.16)*	0.11	2.13
PIEC	0.41 (0.54)			-0.66 (0.16)*	0.01 (0.02)	-0.11 (0.09)	0.14 (0.13)	0.34 (0.15)*	0.26	5.89*

[†] Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

Whilst two of the three measures of revealed comparative advantage, RCEC³, the UK trade balance in the i^{th} industry relative to the EC(6) in 1970/71, and RUKW⁴, the UK trade balance in the i^{th} industry relative to the world in 1970/71, are significant at the 1% level, they have negative signs. This implies that the UK has performed better, within the EC(6), in those commodity markets in which it was weakest relative to the EC(6) and the world, in the pre-entry period. This result can be contrasted with the positive relationship between revealed comparative advantage and PIEC, predicted in chapter 3 on the basis of customs union theory⁵.

The negative and significant signs on RCEC and RUKW may be explained by the relationship between tariffs and the trade balance in the pre-entry period. Thus, as noted in chapter 3, RCEC and RUKW may reflect the distribution of trade barriers in 1970/71, rather than the underlying strength or comparative advantage of the i^{th} UK industry⁶.

In order to overcome this problem RCEC and RUKW were adjusted under two elasticity assumptions, for the height of EC(6) and UK tariff barriers in the pre-entry period 1970/71⁷.

Substitution of the adjusted measures of comparative advantage

3 For a detailed discussion of the specification of this variable, see chapter 3, pp.92-94.

4 For a detailed discussion of the specification of this variable, see chapter 3, pp.92-94.

5 Chapter 3, p.18.

6 Chapter 3, pp.94-95.

7 The adjustment procedure is discussed in chapter 3, pp.94-95.

into the model did not, however, result in any substantive change in the outcome. The adjusted measures of RCEC and RUKW remain significant and negative, and the level of explanation provided by the model does not change significantly. These results have not, therefore, been presented here.

The third measure of comparative advantage, RCRW3 - UK exports of the i^{th} commodity to Canada, Japan and the USA, as a proportion of EC(6) exports to Canada, Japan and the USA in 1970/71⁸ - was negative, but not significant at the 5% level.

The relationship between the three unadjusted measures of comparative advantage is illustrated in Table 4.2.

Table 4.2 Revealed Comparative Advantage. Zero Order Correlation Matrix n = 92

	RCEC	RCRW3	RUKW
RCEC	-		
RCRW3	0.25*	-	
RUKW	0.35*	0.10*	-

† Significant at the 5% level

* Significant at the 1% level

The three measures of revealed comparative advantage are positively and significantly correlated. The correlation coefficients are, however, small, implying that the three proxies for comparative advantage used in this study are, at best, loosely related. Different factors appear to underlie the UK's pattern of trade with the world and the EC(6) in 1970/71.

⁸ For a detailed discussion of the specification of this variable, see chapter 3, pp.96-97.

Inclusion of TEC, the height of the common external tariff in the pre-entry period⁹, ECG, the change in total imports of the i^{th} commodity into the EC(6) between 1970/71 and 1978/79¹⁰, and H, the Heckscher-Ohlin industry dummy¹¹, results in a small increase in the level of explanation provided by the model and a substantial reduction in the F statistic. The three variables were insignificant at the five and ten per cent levels of significance in all of the equations. Inclusion of the variables had a minimal effect on the signs and significance levels of the proxies for revealed comparative advantage.

These results imply that the change in the UK share of total imports into the i^{th} EC commodity market is unrelated to the height of the common external tariff in the pre-entry period. This result is clearly at variance with the positive relationship between TEC and PIEC predicted in chapter 3 on the basis of customs union theory¹². To some extent this result may be explained by the omission of price elasticities from the model¹³. However, even after the introduction of separate price elasticities for finished and semi-finished manufactures¹⁴ TEC remained insignificant at the 5% level. The results have

9 For a detailed discussion of the specification of this variable, see chapter 3, pp.98-99.

10 For a detailed discussion of the specification of this variable, see chapter 3, pp.100-101.

11 For a detailed discussion of the specification of this variable, see chapter 3, p.102.

12 Chapter 3, p.98.

13 See chapter 3, p.99.

14 The introduction of price elasticities is discussed in chapter 3, p.99.

not, therefore, been presented here.

The insignificance of ECG suggests that the change in the UK share of total imports into the i^{th} EC(6) commodity market is unrelated to the rate of growth of total imports into the i^{th} EC(6) commodity market.

This finding is supported by the estimates presented in Tables 4.3 and 4.4. However, whilst the import shares, in Tables 4.3 and 4.4, suggest that the change in the UK share of the total EC(6) imports of the i^{th} commodity group was independent of the rate of growth of the total imports of the i^{th} commodity group into the EC(6), the estimates in Table 4.4 suggest that the UK share was slightly higher in both the pre-entry and post-entry periods in the fastest growing markets. The UK was, therefore, relatively well placed to take advantage of the growth in manufactured imports which took place after UK entry into the EC.

The insignificance of H suggests that the change in the UK share of total imports into the i^{th} EC(6) commodity market cannot be explained by a simple distinction between product cycle and Heckscher-Ohlin industries.

Finally, inclusion of NTB, the non-tariff barrier dummy variable¹⁵, resulted in an increase in the explanatory power of the model. The variable is significant at the 1% level in each of the three equations, and inclusion of the variable resulted in an increase in the F statistic in each case. The UK share of total imports into the i^{th} EC(6) commodity market is therefore positively related to the presence of non-tariff barriers.

15 For a detailed discussion of the specification of this variable, see chapter 3, pp.101-102.

Table 4.3 The Rate of Growth of EC Import Markets and the Import Share of the UK (000 \$s)

1		2		3		4	
ECG.100	ni*	EC(6) M_W 1978/79	EC(6) M_{UK} 1978/79	(2/1).100	EC(6) M_W 1970/71	EC(6) M_{UK} 1970/71	(4/3).100
301-∞	5	25846062	2236655	8.65	6182102	554617	8.97
251-300	6	22211229	758467	3.41	6047877	142713	2.36
201-250	14	105704944	7707333	7.29	32633141	2169546	6.65
151-200	20	61508055	5051580	8.21	22839750	1650886	7.23
101-150	32	74619481	5150018	6.90	33982115	1986632	5.85
51-100	12	52162193	3284727	6.30	29305620	1598675	5.46
0-50	6	13187725	724617	5.50	11031864	625994	5.67
TOTAL	95						

EC(6) = France, Belgium/Luxembourg, West Germany, Italy, Holland

* Includes SITC 396-897

Data adjusted for inflation

Source: Based on Trade by Commodities, Series C, OECD, Paris, various issues

Table 4.4 The Rate of Growth of EC Import Markets and the Import Share of the UK (000 \$s)

		1		2		3		4			
ECG.100	ni*	EC(6) _W	1978/79	EC(6) _{UK}	1978/79	(2/1).100	EC(6) _W	1970/71	EC(6) _{UK}	1970/71	(4/3).100
151- ∞	45	215270290		15754035		7.32	67702870		4517762		6.67
0-150	50	139969399		9159362		6.54	74319599		4211301		5.67

EC(6) = France, Belgium/Luxembourg, West Germany, Italy, Holland

* Includes SITC 896-897

Data adjusted for inflation

Source: Based on Trade by Commodities, Series C, OECD, Paris, various issues

Two types of legal and institutional non-tariff barrier were identified in chapter 3¹⁶: external NTBs which discriminate against the importation of commodities from non-member countries, and internal NTBs which discriminate against imports from other member countries. A positive relationship between the height and change in height of external NTBs, and the dependent variable PIEC, was predicted¹⁷. The relationship between internal NTBs and PIEC was hypothesised to be negative¹⁸.

However, the specified variable (NTB) does not distinguish between external and internal non-tariff barriers. The sign on the variable depends, therefore, on the relative incidence and height of the internal and external non-tariff barriers¹⁹.

The positive sign on NTB implies that external non-tariff barriers dominate within the EC(6). The increase in the incidence and height of EC(6) non-tariff barriers, observed by Page²⁰, appears to have resulted, therefore, in a pattern of discrimination which favours EC members at the expense of non-members.

Overall the results presented in Table 4.1 provide little support for the model developed, in chapter 3, from customs union theory.

16 See chapter 3, p.101.

17 See chapter 3, p.102.

18 See chapter 3, p.102.

19 See chapter 3, p.102.

20 Page, S.A.B. 'The Revival of Protectionism and its Consequences for Europe', Journal of Common Market Studies, Vol. XX, No. 1, September 1981, pp.17-40.

The failure of the model may reflect the mis-specification of the dependent variable. As noted in chapter 3, the use of PIEC as the dependent variable is based on the implicit assumption that the UK share of total EC(6) imports of the i^{th} commodity would have remained constant in the absence of UK entry into the EC²¹. This assumption is clearly unreasonable, since UK competitiveness relative to the EC(6) may have changed in the absence of EC entry. The results may, therefore, reflect changes in the pattern of UK competitiveness which are unrelated to UK entry into the EC.

In order to account for changes in UK competitiveness which are unrelated to UK entry into the EC, the dependent variable was restated as the change in the UK share of total EC(6) imports of the i^{th} commodity between 1970/71 and 1978/79, less the change in the UK share of total RW3 imports of the i^{th} commodity between 1970/71 and 1978/79, (PIA)²². The results are presented in Table 4.5.

The substitution of PIA for PIEC resulted in a reduction in the degree of explanation provided by the model. R^2 lies between 0.04 and 0.23 and the F statistic is significant in only four of the nine estimated equations. The coefficients on two of the measures of revealed comparative advantage, RCEC and RUKW, continue to have the wrong sign and are significant at the 1% level. In contrast, RCRW3 now has the expected positive sign and is significant at the 5% level. Redefinition of the dependent variable, as PIA, results in a substantial increase in the size of the coefficient. However, the degree of explanation provided by the variable is extremely low.

21 See chapter 3, p.89.

22 For a detailed discussion of the specification of this variable, see chapter 3, pp.81-90.

Table 4.5 Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Total Imports into the 1st EC(6) Commodity Market (PIA) n = 92

DV	Const.	RCEC	RCRW3	RUKW	TEC	ECG	H	NTB	R ²	F Stat.
PIA	0.53 (0.69)	-0.92 (0.19)*							0.21	23.80*
PIA	0.25 (0.76)		3.13 (1.53)+						0.04	4.14+
PIA	0.61 (0.73)			-0.53 (0.24)*					0.07	6.34*
PIA	0.62 (0.70)	-0.94 (0.19)*			0.02 (0.03)	-0.16 (0.11)	0.08 (0.15)		0.23	6.49*
PIA	0.11 (0.77)		3.19 (1.57)+		-0.02 (0.03)	-0.10 (0.12)	0.23 (0.17)		0.07	1.58
PIA	0.53 (0.76)			-0.56 (0.22)*	0.02 (0.03)	-0.17 (0.12)	0.34 (0.17)+		0.09	2.19
PIA	0.59 (0.70)	-0.92 (0.20)*			0.01 (0.03)	-0.14 (0.11)	0.05 (0.16)	0.13 (0.20)	0.23	5.25*
PIA	0.03 (0.76)		3.40 (1.57)+		0.02 (0.03)	-0.05 (0.12)	0.15 (0.17)	0.29 (0.21)	0.09	1.64
PIA	0.50 (0.76)			-0.53 (0.23)+	0.01 (0.03)	-0.15 (0.13)	0.31 (0.18)	0.11 (0.22)	0.09	1.79

+ Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

TEC, ECG and H continued to be insignificant at the 5% level in all of the estimated equations. Inclusion of these variables resulted in a small increase in R^2 and a substantial reduction in the overall significance of each of the estimated equations.

The introduction of NTB into the estimated equation had little impact on the degree of explanation provided by the model, but resulted in a substantial reduction in the F statistic. The variable is positive but insignificant at the 5% level in each of the estimated equations. This result can be contrasted with the positive and significant sign at the 1% level on NTB when PIEC is used as the dependent variable. It implies that the UK share of total imports into the RW3 increased relatively rapidly in those commodity groups which were characterised by the presence of non-tariff barriers within the EC. This conclusion is supported by the zero order correlation coefficients between NTB and the change in the UK share of total imports into the RW3 and the change in the UK share of total imports into the EC(6). The zero order correlation coefficients were 0.16 and 0.33 respectively. Thus, whilst the UK share of total EC(6) imports does appear to increase relatively rapidly in those industries which are characterised by the presence of NTBs, some proportion of this increase must be explained by factors other than the erection of external NTBs by the EC.

In order to further investigate the strong negative relationship between revealed comparative advantage and the change in the UK share of the i^{th} EC(6) market, the twenty commodity groups in which the UK share of total imports into the i^{th} EC(6) market has grown fastest, and the twenty commodity groups in which the UK share of total imports into the i^{th} EC(6) market has grown slowest, were

isolated and ranked in descending order by rate of growth²³. These rankings are presented in Table 4.6 and plotted against RCEC, the UK trade balance, in the i^{th} industry relative to the EC(6) in 1970/71, in Diagram 4.1.

The evidence presented in Table 4.6 and Dia. 4.1 highlights the negative relationship between revealed comparative advantage and the change in the UK share of the i^{th} EC market. The UK had a negative trade balance with the EC(6) in 1970/71 in sixteen of the twenty commodity groups in which the UK market share increased most rapidly after UK entry into the EC. Similarly, of the twenty industries in which the UK share of total EC(6) imports fell, the UK had a negative trade balance with the EC(6) in only two in 1970/71.

Analysis of Table 4.6 and Dia. 4.1 suggested that those markets in which the UK share increased fastest after UK entry into the EC were characterised by the small, or very small, share held by the UK in the pre-entry period. Thus the UK share of the ten markets in which the UK share grew fastest, accounted for under 2% of total imports into each of these markets in 1970/71. At the same time the UK accounted for over 8% of the total imports into the EC(6) in the twenty commodity groups in which the UK performed worst in the post-entry period.

The relationship between the change in the UK share of the EC market and the initial share may reflect the relative ease with which market share can be increased if the initial market share is very small.

Thus, whilst the percentage increase in the UK share of these markets was relatively large, the absolute increase in the UK share

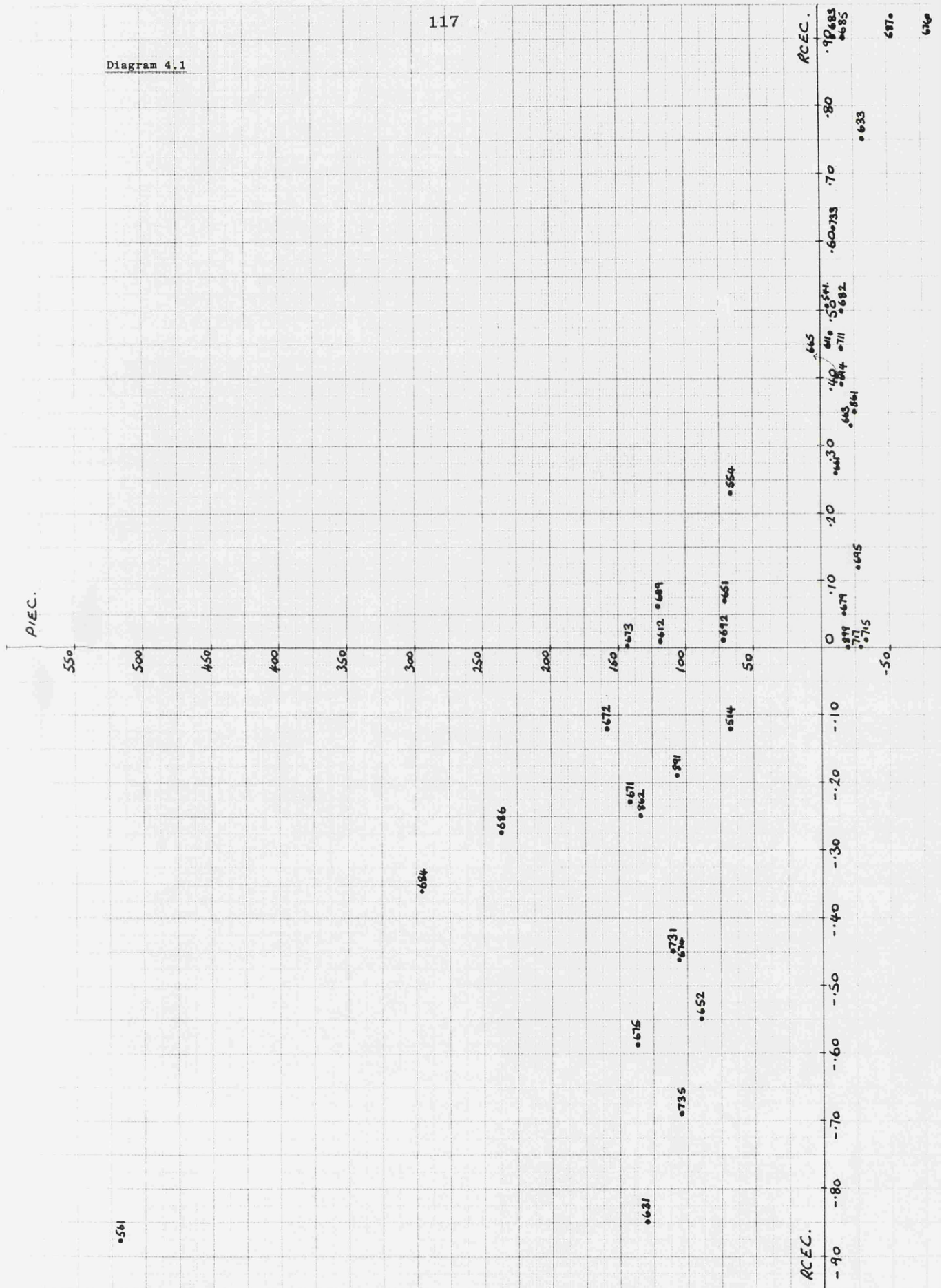
23 For a complete listing of the data see Appendix 1.

Table 4.6 The Commodity Groups in which the UK Share of Total Imports into the 1st EC(6) Market has Grown Fastest and Slowest

SITC	20 Fastest Growing Industries	PIEC	SITC	20 Slowest Growing Industries	PIEC
561	Manufactured fertiliser	518.37	676	Rails and track construction materials	-80.67
684	Aluminium	295.00	687	Tin	-53.90
686	Zinc	238.60	715	Metalworking machinery	-33.26
672	Ingots and other primary forms	158.08	633	Cork manufactures	-32.69
673	Bars, rods, angles, shapes	145.83	717	Textile and leather machinery	-30.80
671	Pig-iron, sponge-iron, ferro-alloys	144.74	695	Tools for hand or machine	-26.64
675	Hoops and strips	137.86	861	Scientific, medical, optical instruments	-24.81
862	Photographic supplies	134.61	663	Mineral manufactures NES	-24.61
631	Veneers, plywood supplies	129.10	899	Manufactured articles NES	-23.34
689	Miscellaneous non-ferrous metals	122.08	685	Lead	-19.03
612	Manufactures of leather	119.78	679	Castings and forgings	-16.78
731	Railway vehicles	113.87	682	Copper	-15.67
674	Universals, plates and sheets	112.10	711	Power-generating machinery	-15.07
891	Musical instruments and recorders	107.12	694	Nails, screws, nuts, bolts, rivets	-15.05
735	Ships and boats	104.34	661	Lime, cement, building materials	-14.87
652	Cotton fabrics, woven	91.27	665	Glassware	-12.96
692	Metal containers for storage and transport	74.58	683	Nickel	-10.99
651	Textile yarn or thread	73.28	733	Road vehicles, non-motor	-8.64
554	Soaps, cleansing, polishing products	72.80	611	Leather	-8.57
514	Other inorganic chemicals	72.71	541	Medical and pharmaceutical products	-8.23

Source: Based on Trade by Commodities, Series C, OECD, various issues

Diagram 4.1



of these markets was relatively small. Whilst the UK share of the total imports of manufactured fertilisers into the EC(6) increased by 518%, the absolute share of the UK increased by only 1.67%.

The results may, therefore, reflect the relative ease with which market share can be expanded, if the initial market share is small and the use of percentage rather than absolute changes as the basis of the dependent variable.

In order to overcome these problems, both variants of the model were re-estimated using a sub-sample of 76 industries which did not include those industries in which the UK share of the i^{th} market was less than 2% in 1970/71²⁴. The results are presented in Tables 4.7 and 4.8.

Restriction of the sample has little effect on the results. RCEC continues to be significant and negative at the 1% level, whilst RCRW3 is positive but insignificant at the 5% level in all of the estimated equations. TEC, P and ECG are all insignificant at the 5% level.

NTB, the non-tariff barrier dummy, is significant at the 1% level, and positive when PIEC is used as the dependent variable. When PIA is used as the dependent variable and RCRW3 is selected as the measure of revealed comparative advantage, NTB is significant at the 1% level, positive, and makes a substantial contribution to the degree of explanation provided by the model. Inclusion of NTB results in an increase in the coefficient of determination from 0.03 to 0.14, and an increase in the F statistic from 2.40 to 5.68.

24 These commodity groups accounted for 3.24% of total UK manufactured exports to the EC(6) in 1970/71. The commodity groups were SITC: 561, 612, 631, 652, 661, 671, 672, 673, 674, 675, 684, 686, 731, 812, 831, 851, 864, 897.

Table 4.7 Regression Analysis: the Determinants of the Change in the UK Share of Total Imports into the 1th EC(6) Commodity Market (PIEC) n = 76

DV	Const.	RCECO	RCRW3	TEC	ECG	P	NTB	R ²	F Stat.
PIEC	0.40 (0.49)	-0.79 (0.15)*						0.26	26.17*
PIEC	0.30 (0.56)		0.04 (0.05)					0.01	0.63
PIEC	0.28 (0.45)	-0.64 (0.15)*		0.03 (0.02)	-0.11 (0.09)	-0.12 (0.12)	0.46 (0.14)*	0.42	9.93*
PIEC	0.01 (0.50)		0.05 (0.04)	0.04 (0.03)	-0.09 (0.10)	-0.07 (0.14)	0.63 (0.15)*	0.27	5.21*

† Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

Table 4.8 Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Total Imports into the 1th EC(6) Commodity Market (PIA) n = 76

DV	Const.	RCECO	RCRW3	TEC	ECG	P	NTB	R ²	F Stat.
PIA	0.56 (0.62)	-0.86 (0.19)*						0.21	19.32*
PIA	0.41 (0.68)		0.08 (0.05)					0.03	2.40*
PIA	0.68 (0.61)	-0.78 (0.20)*		0.01 (0.03)	-0.13 (0.12)	-0.22 (0.16)	0.27 (0.19)	0.28	5.41*
PIA	0.28 (0.66)		0.09 (0.06)	0.03 (0.03)	-0.10 (0.13)	-0.15 (0.18)	0.48 (0.19)*	0.15	2.51*

† Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

However, when RCECO is used as the measure of revealed comparative advantage, NTB is positive but insignificant. The zero order correlation coefficient between NTB and PIA is significant at the 1% level, and equal to 0.32.

The insignificance of NTB, when RCECO is included as a measure of revealed comparative advantage, may be explained by the presence of multicollinearity between the independent variables. The simple correlation coefficient between RCECO and NTB is significant at the 1% level, and equal to 0.27. Whilst this coefficient is not large in absolute terms, it is large relative to the degree of explanation provided by the model. The link between RCECO and NTB is highlighted in Table 4.6. Of the twenty industries in which the UK's share of the total imports into the 1th EC(6) industry grew fastest, nine had substantial non-tariff barriers²⁵. In the case of eight of these industries RCECO was negative in 1970/71.

This finding illustrates some of the problems associated with the use of RCECO as a measure of comparative advantage. Thus RCECO may reflect not only the pattern of revealed comparative advantage in the pre-entry period, but also the presence and height of tariff and non-tariff barriers in 1970/71. When RCECO is negative this may, therefore, reflect the presence and height of non-tariff barriers in the pre-entry period rather than the presence of a revealed comparative disadvantage in this commodity²⁶.

The changing pattern of UK penetration within the EC, and the

25 SITC commodity groups: 684, 672, 673, 671, 675, 674, 735, 652, 651.

26 See chapter 3, pp.94-95.

failure of the model to explain the variation in the dependent variable, can also be explained by a number of industry specific factors. Thus the fall in the UK share of total imports into the EC markets for nails, screws, nuts and bolts (SITC 694), tools for hand or machine (SITC 695), household equipment (SITC 697) and metal manufactures, can be partly explained by the rapid increase in the share of the newly industrialising countries from 1.8% to 9.5%, 2.5% to 7.7%, 6.6% to 19.0%, and 3.9% to 8.4% respectively²⁷. Similarly the fall in the UK share of EC(6) imports from the world of SITC commodity groups 698, 715, 714, 717, 718, 729 and 695 can be partly explained by an increase in the relative competitiveness, and share, of Japan in these commodity groups²⁸.

The decline in UK competitiveness relative to Japan and the newly industrialising countries may, therefore, explain the poor performance of the model when the change in the UK share of total imports into the i^{th} EC(6) commodity market (PIEC) is used as the dependent variable.

However, when PIA, the adjusted change in the UK share of total imports into the i^{th} EC(6) market, is used as the dependent variable, the results fail to improve. Since PIA was explicitly designed to incorporate changes in UK competitiveness which are unrelated to UK entry into the EC, this suggests that the poor performance of the estimated models must be explained either by the omission and mis-specification of the independent variables, or by the mis-specification of the dependent variable PIA.

In order to overcome this problem the dependent variable was redefined as the change in the UK's share of total imports into the

27 OECD, Trade by Commodities, Series C, various issues.

28 Ibid.

i^{th} EC(6) commodity market from the EC(7), $(PEC7)^{29}$. This variable was adjusted for changes in UK competitiveness which are unrelated to UK entry into the EC by subtracting the change in the UK share of total imports from the EC(7) into the i^{th} RW3 market, from $PEC(7)$, $(PIA7)^{30}$.

Section II - The Determinants of the Change in the UK Share of Total Imports into the i^{th} EC(6) Commodity Market from the EC(7)

The results generated using the unadjusted and adjusted versions of the modified dependent variable are presented in Tables 4.9 and 4.10 respectively.

Modification of the dependent variable appears to have had a limited impact on the results generated by the model. When $PEC7$, the unadjusted version of the dependent variable, is used, two of the measures of revealed comparative advantage - $RCEC$ and $RUKW$ - remain negative and significant at the 1% level. $RCRW3$, the third measure of revealed comparative advantage, has the expected positive sign but is not significant at the 5% level. TEC , the height of the Common External Tariff in the pre-entry period, ECG , the change in total imports into the i^{th} EC(6) commodity market, and H , the Heckscher-Ohlin industry dummy, remain insignificant at the 5% level.

NTB , the non-tariff barrier dummy, is positive and significant at the 1% level. The change in the UK share of total imports into the i^{th} EC(6) commodity market from the EC(7) is, therefore, positively related to the incidence of NTBs. This implies that entry into the EC has enabled the UK to circumvent external non-tariff barriers.

29 For a detailed discussion of the specification of this variable, see chapter 3, pp.90-91.

30 For a detailed discussion of the specification of this variable, see chapter 3, pp.90-91.

Table 4.9 Regression Analysis: the Determinants of the Change in the UK Share of Imports from the EC(7) into the EC(6) Commodity Market (PEC7) n = 92

DV	Const.	RCEC	RCRW3	RUKW	TEC	EC6	H	NTB	R ²	F Stat.
PEC7	0.58 (0.68)	-0.99 (0.19)*							0.24	28.36*
PEC7	0.52 (0.78)		-0.01 (0.06)						0.00	0.01
PEC7	0.66 (0.74)			-0.66 (0.20)*					0.10	10.42*
PEC7	0.38 (0.69)	-0.97 (0.19)*			0.02 (0.03)	0.03 (0.11)	0.02 (0.15)		0.25	7.12*
PEC7	0.14 (0.78)		0.02 (0.07)		0.02 (0.03)	0.09 (0.12)	0.17 (0.17)		0.03	0.60
PEC7	0.26 (0.72)			-0.56* (0.20)	0.01 (0.03)	0.13 (0.42)	0.48 (0.19)		0.17	4.56*
PEC7	0.27 (0.67)	-0.91 (0.19)*			0.01 (0.03)	0.11 (0.11)	-0.09 (0.16)	0.43 (0.19)*	0.29	7.02*
PEC7	0.02 (0.76)		0.02 (0.06)		0.01 (0.03)	0.19 (0.12)	0.01 (0.17)	0.56 (0.21)*	0.10	1.94
PEC7	0.21 (0.72)			-0.65 (0.22)*	0.02 (0.03)	0.09 (0.12)	0.19 (0.17)	0.39 (0.20)†	0.18	3.89*

† Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

Table 4.10 Regression Analysis: the Determinants of the Adjusted Change in the UK Share of Imports from the EC(7) into the EC(6) Commodity Market (PIA7) n = 92

DV	Const.	RCEC	RCRW3	RUKW	TEC	ECG	H	NTB	R ²	F Stat.
PIA7	0.65 (0.80)	-0.85 (0.22)*							0.16	16.52*
PIA7	0.54 (0.86)		0.07 (0.07)						0.01	1.20
PIA7	0.71 (0.81)			-0.53 (0.23)*					0.06	5.30*
PIA7	0.48 (0.80)	-0.86 (0.22)*			0.03 (0.03)	-0.05 (0.13)	0.00 (0.18)		0.16	4.22*
PIA7	0.17 (0.87)		0.10 (0.07)		0.04 (0.04)	-0.02 (0.14)	0.16 (0.19)		0.03	0.70
PIA7	0.49 (0.84)			-0.64 (0.24)*	0.03 (0.04)	-0.10 (0.14)	0.27 (0.19)		0.08	1.95
PIA7	0.51 (0.81)	-0.87 (0.23)*			0.02 (0.03)	-0.04 (0.13)	-0.06 (0.19)	0.22 (0.22)	0.17	3.57*
PIA7	0.08 (0.86)		0.10 (0.07)		0.03 (0.04)	0.04 (0.14)	0.06 (0.20)	0.35 (0.24)	0.06	1.01
PIA7	0.44 (0.85)			-0.59 (0.25)*	0.03 (0.04)	-0.06 (0.14)	0.21 (0.21)	0.20 (0.24)	0.08	1.68

+ Significant at the 5% level

* Significant at the 1% level

Figures in brackets are Sê's

and increase its share of the EC(6) market relative to the EC(6).

Finally, the level of explanation provided by the model, and the overall significance of the estimated equations, exhibit a slight decline after the substitution of PEC7 for PIEC.

The substitution of PIA7, the adjusted change in the UK share of total imports into the i^{th} EC(6) commodity market from the EC(7), for PIA, the adjusted change in the UK share of total imports into the i^{th} EC(6) commodity market, produced a similar set of results.

The level of explanation provided by the model and the F statistic exhibit a slight decrease. RCEC and RUKW remain significant and negative. RCRW3, TEC, ECG and H remain insignificant at the 5% level. NTB, the non-tariff barrier dummy, was positive, but not significant at the 5% level. This implies that the UK share of total imports into the RW3 increased relatively rapidly in those commodity groups which were characterised by the presence of non-tariff barriers within the EC.

Redefinition of the dependent variable as the change in the UK share of total imports into the i^{th} EC(6) commodity group from the EC(7) did not, therefore, produce a substantial improvement in the quality of the results generated by the model. The measures of revealed comparative advantage continued to be negative and insignificant and, of the independent variables, only NTB, the non-tariff barrier dummy, had the right sign or was significant at the 5% level.

The elimination of the smallest industries from the sample and the modification of the measures of revealed comparative advantage, in order to adjust for the effect of the existing tariff structure in 1970/71, also failed to improve the quality of the results. They have not, therefore, been presented here.

Section III - Conclusion

The results, outlined in the two preceding sections, provide little support for the predictions of the traditional theory of customs unions. The tariff variable is not significant in any of the estimated equations, and the measures of revealed comparative advantage are either not significant or have the wrong sign. The negative relationship between revealed comparative advantage and the dependent variable suggests that the UK has performed relatively badly within the EC(6) in those commodity markets in which it was strongest, relative to the world and the EC(6), in the pre-entry period. Whilst the non-tariff barrier dummy, NTB, was positive and significant when related to the unadjusted versions of the dependent variable (PIEC and PEC7), it was not significantly related to the adjusted versions of the dependent variable (PIA and PIA7). The remaining independent variables (H and CA) were not significant in any of the estimated equations.

These results are, however, only indicative. The poor performance of the model may reflect the problems of specification and measurement, which were extensively discussed in chapter 3. These problems can be divided into two broad groups: firstly, errors of omission, in particular the absence of a satisfactory measure of the price elasticity of demand in the 1th commodity market; secondly, the problems of developing satisfactory measures of the dependent and independent variables - in particular the difficulties associated with the derivation of a normalised estimate of the dependent variable and the generation of a measure of revealed comparative advantage which is independent of the structure of UK-EC tariff, and non-tariff, barriers during the pre-entry period.

PART 3

The Impact of UK Entry into the EC(6) on Intra
Industry Trade Between the UK and the EC(6):
A Test of the Theory of Intra Industry Trade

CHAPTER 5

The Impact of UK Entry into the EC(6) on Intra IndustryTrade Between the UK and the EC(6)

According to the discussion in chapter 1, traditional customs union theory predicted that the entry of the UK into the EC would result in an increase in inter industry trade and specialisation, in line with the pattern of comparative advantage in the member states¹. The theory of intra industry trade, on the other hand, predicted that UK entry into the EC would result in an increase in intra industry trade and specialisation², a prediction which is supported by the ex post studies of the formation of the EC outlined in chapter 2³.

In this chapter the impact of UK entry into the EC on the amount and proportion of intra and inter industry trade in the total trade in manufactured goods between the UK and the EC(6) is estimated, in order to test the predictions of the traditional theory of customs unions, and intra industry trade theory. An increase in inter industry trade and specialisation will provide support for the traditional theory of customs unions, whereas an increase in intra industry trade will provide support for the predictions of the theory of intra industry trade. The change in the pattern of intra industry trade between the UK and the EC(6) is then analysed at the industry level, within a multivariate model derived from the theory of intra industry trade outlined in chapter 1⁴.

1 See chapter 1, p.30.

2 See chapter 1, p.30.

3 See chapter 2, pp.56-65.

4 See chapter 1, pp.20-30.

The relationship between intra industry trade and EC formation has been investigated in a number of earlier studies⁵. However, this is the first attempt both to assess the impact of UK entry into the EC on the proportion and amount of intra and inter industry trade in the total trade in manufactured commodities between the UK and the EC(6)⁶, and to explain the change in intra industry trade at the industry level within the framework of a multivariate model based on the theory of intra industry trade⁷.

The chapter is divided into four sections. The measure of intra industry trade used in this study is discussed in section I. The aggregate estimates of intra and inter industry trade in manufactured products are then analysed in section II. Section III contains an outline of the multivariate model and a detailed discussion of the

5 See for example Grubel, H.G. and Lloyd, P.J. Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Macmillan, 1975; Balassa, B. 'Tariff Reduction and Trade in Manufactures Among the Industrial Countries', American Economic Review, Vol. 56, June 1966, pp. 466-73; Sazanami, Y. and Hamuguchi, N. 'Intra-Industry Trade in EEC, 1962-1972', Keio Economic Studies, Vol. XV, 1978, pp.53-68; Glejsar, H., Goosens, K. and Van den Eede, M. 'Inter-Industry versus Intra Industry Specialization in Exports and Imports (1959-1970-1973)', Journal of International Economics, Vol. 12, 1982, pp.363-69.

6 Kreinen, M.E. 'Static Effects of EC Enlargement on Trade Flows in Manufactured Products', Kyklos, Vol. 34, 1981, pp.60-71, has investigated the impact of the first enlargement on the proportion of intra industry trade in the total trade between thirteen EC and EFTA countries. See chapter 2 for a detailed discussion of this paper, pp.56-65.

7 Inter industry differences in the level of intra industry trade has been examined in a number of cross-section studies. See for example: Loertscher, R. and Wolter, F. 'Determinants of Intra Industry Trade: Among Countries and Across Countries', Weltwirtschaftliches Archiv, Vol. 116, 1981, pp.280-93; Pagoulatos, E. and Sorenson, R. 'Two-Way International Trade: An Economic Analysis', Weltwirtschaftliches Archiv, Vol. 111, 1975, pp.454-65; Caves, R.E. 'Intra-Industry Trade and Market Structure in the Industrial Countries', Oxford Economic Papers, Vol. 33, 1981, pp.203-23; Greenaway, D. 'Intra-Industry and Inter Industry Trade in Switzerland', Weltwirtschaftliches Archiv, Vol. 119, 1983, pp.109-21; Toh, K. 'A Cross-Section Analysis of Intra Industry Trade in UK Manufacturing Industries', Weltwirtschaftliches Archiv, Vol. 118, 1982, pp.281-301.

measurement and specification of each of the dependent and independent variables. The results are then outlined and analysed in section IV.

Section I - The Measurement of Intra Industry Trade

The analysis in this chapter is based on two measures of intra industry trade: the amount of intra industry trade, and the proportion of intra industry trade.

Both variables are based on the measure of intra industry trade developed by Grubel and Lloyd⁸. They define the amount of intra industry trade in the i^{th} industry, ITA_{ij} , as that part of the exports of the i^{th} industry which is exactly matched by its imports (Equation 5.1).

Equation 5.1

$$ITA_{ij} = (X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|$$

where:

X = exports

M = imports

i = industry

j = country or trading group.

An aggregate estimate of the amount of intra industry trade for manufacturing industry as a whole can then be obtained by summing the industry estimates of the amount of intra industry trade (Equation 5.2).

⁸ Grubel and Lloyd, op. cit.

Equation 5.2

$$ITA_j = \sum_1^n [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|]$$

The proportion of intra industry trade in the i^{th} industry can be found by expressing ITA_{ij} as a percentage of total trade in the i^{th} industry (Equation 5.3).

Equation 5.3

$$ITP_{ij} = [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|] / (X_{ij} + M_{ij}) \cdot 100$$

This measure is independent of industry size and will vary between zero, when there is no intra industry trade, and one hundred, when all of the trade in the industry is intra industry trade.

Following Grubel and Lloyd, the aggregate measure of the proportion of intra industry trade in total manufactured trade can then be defined as the weighted average of the industry estimates, where the weights are given by each industry's share in manufactured trade (Equation 5.4).

Equation 5.4

$$ITP_j = \sum_1^n ITP_{ij} (X_{ij} + M_{ij}) / \sum_1^n (X_{ij} + M_{ij}) \cdot 100$$

As noted in chapter 2⁹, the proportion of intra industry trade will be biased downwards if the overall trade in manufactured goods between the countries is not in balance. In order to overcome this

⁹ See chapter 2, pp.58-60.

problem the estimates of the amount and proportion of intra industry trade were corrected using the method developed by Aquino. This method is based on the assumption that the trade imbalances are equi-proportional in all industries and equal to the overall trade imbalance¹⁰.

The corrected measures of the proportion and amount of intra industry trade in the i^{th} industry can then be restated as:

Equation 5.5

$$ITPC_{ij} = \frac{(a_j X_{ij} + b_j M_{ij}) - |a_j X_{ij} - b_j M_{ij}|}{(a_j X_{ij} + b_j M_{ij})}$$

Equation 5.6

$$ITAC_{ij} = (a_j X_{ij} + b_j M_{ij}) - |a_j X_{ij} - b_j M_{ij}|$$

where:

$$a_j = \sum_i (X_{ij} + M_{ij}) / 2 \sum_i X_{ij}$$

$$b_j = \sum_i (X_{ij} + M_{ij}) / 2 \sum_i M_{ij}$$

The analysis is based on 93 three-digit SITC commodities drawn from the manufacturing sector, sections five to eight of the SITC. In chapter 2¹¹ it was argued that the three-digit level of the SITC is a far from perfect proxy for the theoretical concept of an industry which underlies intra industry trade theory. The three-digit SITC commodity groups include goods with different factor inputs. In

10 See Aquino (1978), 'Intra-Industry Trade and Intra Industry Specialisation as Concurrent Sources of International Trade in Manufactures', Weltwirtschaftliches Archiv, Vol. 114, 1978, for a discussion of the relative merits of different methods of adjustment.

11 See chapter 2, pp.60-63.

addition goods with different factor inputs may be included in more than one commodity group. This implies that the estimates of intra industry trade may be biased either up or down depending on the relative strength of these effects¹².

Two methods of reducing these sources of bias were considered:

1. Reclassification of the seven-digit SITC commodity groups according to factor intensity.
2. The measurement of intra industry trade at a lower level of aggregation which corresponds more closely to the theoretical concept of an industry.

Both reclassification and disaggregation were rejected because they would have required a data collection and collation exercise which lies beyond the scope of the present study.

Selection of the three-digit level of the SITC, as the basis of the analysis, had the advantage of keeping the task of data collection and collation within manageable limits. At the same time the results of such an analysis could be compared with a number of other studies which have been carried out at the three-digit level of the SITC¹³.

Section II - Aggregate Estimates of UK Intra Industry Trade

In this section the impact of UK entry into the EC(6) on the aggregate estimates of the amount and proportion of intra industry trade in manufactured goods between the UK and the EC(6) is investigated.

¹² See chapter 2, p.61.

¹³ See, for example, Kreinen, op. cit.; Grubel and Lloyd, op. cit.; Sazanami and Hamuguchi, op. cit.

The amount and proportion of intra industry trade with the EC(6) may well have changed in the absence of EC enlargement. Grubel and Lloyd, Kreinen¹⁴ and Rayment¹⁵ have all observed the gradual upward trend in the proportion of intra industry trade in the trade in manufactured goods between the industrial nations. This upward trend may be explained by the reduction in tariffs which has marked the post-war period¹⁶ or by factors which are unrelated to trade liberalisation¹⁷.

In order to overcome this problem the change in intra industry trade between the UK and the EC(6) is compared with the change in the amount and proportion of intra industry trade with three groups of trading partners. These groups include the world, the rest of the world - which is defined as the world less the EC(6) - and RW3, which is made up of Canada, Japan and the USA. Simple comparison with the rest of the world would have been inadequate because intra industry trade forms a smaller proportion of trade with the developing than the developed world. Canada, Japan and the USA were selected as a basis for comparison because they are advanced industrial countries.

The aggregate estimates of the proportion of intra industry trade, in total UK trade in manufactured goods with the four trading blocs, are presented in Table 5.1.

14 Kreinen, op. cit.

15 Rayment, op. cit.

16 See Grubel and Lloyd, op. cit.

17 See chapter 2, pp.63-65.

Table 5.1 The Proportion of Intra Industry Trade in Total UK Trade in Manufactures¹

	1970-1971			1978-1979		
	Intra Industry Trade	Total Trade	ITP _j ²	Intra Industry Trade	Total Trade	ITP _j ²
UK-W ³	44882823	72181768	62.18	135357501	181494737	74.58
UK-R/W ⁴	27575244	54339468	50.75	68904723	118913411	57.95
UK-EC(6) ⁵	14143254	17843300	79.26	46046160	62581326	73.58
UK-RW3 ⁶	7742352	15026043	51.53	17398349	26827676	64.85

1 The Table is based on three-digit SITC data obtained from Series C Trade by Commodities, published by the OECD. UK import and export data were used.

$$2 \text{ ITP}_j = \frac{\sum_i^n (X_{ij} + M_{ij})}{\sum_i^n |X_{ij} - M_{ij}|} \cdot \frac{\sum_i^n (X_{ij} + M_{ij})}{\sum_i^n (X_{ij} + M_{ij})} 100. \quad n = 93.$$

3 W = world.

4 R/W = world less EC(6).

5 EC(6) = West Germany, France, Italy, Belgium/Luxemburg, Holland.

6 RW3 = United States, Canada, Japan.

The estimated values of ITP_j for 1970/71 provide some support for the predictions of intra industry trade theory. The proportion of intra industry trade in manufactured trade with the EC(6) is relatively high. This finding is in line with the relatively high proportion of intra industry trade in the trade between industrial

countries, found by other researchers¹⁸. These results can be explained by factor and demand similarities between industrial countries. The much smaller proportion of intra industry trade in UK manufactured trade with the rest of the world probably reflects the presence of developing countries in this trading group. The developing countries will tend to have different factor endowments and demand patterns from the industrial countries. This will have the effect of encouraging inter industry, rather than intra industry, trade between industrial and developing countries. The relatively small proportion of intra industry trade in UK trade with RW3 was unexpected, since Canada, the United States and Japan are all industrial countries. This result may be explained, however, by the relatively small proportion of intra industry trade in the total manufactured trade of Japan¹⁹.

The results for 1978/79 suggest that the same underlying pattern is still present. Thus the estimated proportion of intra industry trade between the UK and the EC(6) is still substantially higher than that between the UK and the rest of the world.

However, the results provide little support for the hypothesis that UK entry into the EC would result in an increase in the proportion of intra industry trade in UK manufactured trade with the EC(6). Whilst the proportion of intra industry trade in manufactured trade with the EC(6) fell from 79.26% in 1970/71 to 73.58% in 1978/79, the proportion of intra industry trade in total trade with each of the other trading groups increased. Thus ITP_j increased from 62.18% to

18 See for example Sazanami and Hamuguchi, op. cit., and Grubel and Lloyd, op. cit.

19 See for example Sazanami, Y. 'Japanese Trade in Manufactured Goods', Mita Journal of Economics, Vol. 66, No. 9, 1973.

74.58% in the case of the world, from 50.75% to 57.95% in the case of the rest of the world, and from 51.53% to 64.85% in the case of RW3.

These results suggest that the pattern of UK trade with the EC after UK entry into the EC has been marked by an increase in inter, rather than intra, industry specialisation. The results are, however, open to question since the estimates of intra industry trade shown in Table 5.1 will be biased downwards if UK trade with the trading groups is not in balance²⁰.

The UK's balance of trade with each of the trading groups in 1970/71 and 1978/79 is shown in Table 5.2.

Table 5.2 The UK's Balance of Trade in Manufactures, 1970/71 and 1978/79¹

	W ²	EC ³	R/W ⁴	RW3 ⁵
1970/71	38.53%	3.99%	47.36%	-15.21%
1978/79	21.66%	-41.33%	43.20%	-42.36%

1 The Table is based on three-digit SITC data obtained from Series C Trade by Commodities, published by the OECD. UK import and export data were used.

2 W = world.

3 R/W = world less EC(6).

4 EC(6) = West Germany, France, Italy, Belgium/Luxemburg, Holland.

5 RW3 = United States, Canada, Japan.

The Table highlights the presence of substantial trade imbalances in 1970/71 and 1978/79 and the rapid decline in the UK's balance of trade with the world, the EC(6) and RW3 during the post-enlargement period.

The discussion in chapter 2 suggests

²⁰ See chapter 2, p.58.

that these results have three consequences for the measurement of intra industry trade²¹. Firstly, the estimates of the proportion of intra industry trade in 1970/71 and 1978/79 will be biased downwards. Secondly, the estimates will be biased by different amounts since the trade imbalance differs substantially between trading groups. Thirdly, the extent of the bias has increased with respect to the EC(6) and the RW3, and decreased in the case of the world and the rest of the world.

In order to overcome these problems the industry estimates of intra industry trade were corrected using the adjusted measure of intra industry trade developed by Aquino²². The revised estimates are presented in Table 5.3.

Correction of the 1970/71 estimates has a substantial impact on the estimated proportion of intra industry trade between the UK and the world, and the UK and the rest of the world. Relative to the unadjusted estimates, the proportion of intra industry trade increases by 3.44% with the world, 3.30% with the rest of the world and 15.88% with the RW3. A small decrease in the proportion of intra industry trade in total manufactured trade between the UK and the EC(6) can be observed.

21 See chapter 2, pp.58-60.

22 Aquino, op. cit.

Table 5.3 Corrected Estimates of the Proportion of Intra Industry Trade in Total UK Manufactured Trade¹

	1970-1971			1978-1979		
	Intra Industry Trade	Total Trade	ITPC _j ²	Intra Industry Trade	Total Trade	ITPC _j
UK-W ³	51149721	72182768	70.86	134855673	181494737	74.30
UK-R/W ⁴	32173837	54339468	59.21	74337715	118913411	62.51
UK-EC(6) ⁵	13993245	17843300	78.42	47972190	62581326	76.66
UK-RW3 ⁶	7851333	15026043	52.25	18278490	26827676	68.13

1 The Table is based on three-digit SITC data obtained from Series C Trade by Commodities, published by the OECD. UK import and export data were used.

$$2 \text{ ITPC}_j = \frac{\sum_i^n (a_j X_{ij} + b_j M_{ij})}{\sum_i^n (a_j X_{ij} + b_j M_{ij})} - \frac{\sum_i^n |a_j X_{ij} - b_j M_{ij}|}{\sum_i^n (a_j X_{ij} + b_j M_{ij})}$$

$$\text{where } a_j = \frac{\sum_i (X_{ij} + M_{ij})}{2 \sum_i X_{ij}}$$

$$b_j = \frac{\sum_i (X_{ij} + M_{ij})}{2 \sum_i M_{ij}}$$

3 W = world.

4 R/W = world less EC(6).

5 EC(6) = West Germany, France, Italy, Belgium/Luxemburg, Holland.

6 RW3 = United States, Canada, Japan.

The adjusted estimates of the proportion of intra industry trade in total UK manufactured trade with the world, the rest of the world and the RW3, change in the same direction as the unadjusted estimates during the post-enlargement period. However, both the increase in the case of the world and the rest of the world, and the decrease in the case of the EC(6), are markedly smaller than the unadjusted estimates of the changes in intra industry trade with those trading groups.

These results suggest that a substantial component of the change in the proportion of intra industry trade with each of the trading groups can be ascribed to the change in trading balances. Adjustment

of the estimates does not, however, affect the underlying conclusions which were reached on the basis of the unadjusted data. Thus the adjusted proportion of intra industry trade with the EC(6) declined from 78.42% in 1970/71 to 76.66% in 1978/79, whilst intra industry trade with the other trading groups increased. The adjusted estimates do not, therefore, provide any support for the prediction that UK entry into the EC would result in an increase in the proportion of intra industry trade between the UK and the EC(6).

The impact of UK entry into the EC(6) on the pattern of UK trade is further investigated in Table 5.4. The results outlined in this Table show the percentage of the change in total trade in manufactured goods with each of the trading groups which is accounted for by the change in intra industry trade. Both corrected and uncorrected estimates are presented.

The uncorrected results highlight the importance of intra industry trade as a proportion of the growth of total trade. Intra industry trade accounted for 82.77% of the increase in total UK trade with the world, and 71.31% of the increase in UK trade with the EC(6). The corrected estimates of the increase in the share of intra industry trade in total trade with the world and the EC(6) are 76.58% and 75.95% respectively.

Thus the bulk of the increase in UK trade with the world and the EC(6) has taken the form of an increase in intra, rather than inter, industry trade. This result is in line with the uncorrected estimate of the share of intra industry trade in intra EC(6) trade expansion after the formation of the EC(6), calculated by Grubel and Lloyd²³.

23 Grubel and Lloyd, op. cit.

Table 5.4 The Change in Intra Industry Trade as a Percentage of the Change in Total Trade¹

	I	II	III	IV	V	VI
	Δ in Total Trade	Δ in ₂ Intra Industry Trade	(2-1)/1	Δ in Total Trade	Δ in ₃ Intra Industry Trade	(5-4)/(4)
UK-W ⁴	109311969	90474678	82.77%	109311969	83705952	76.58%
UK-R/W ⁵	64573943	41329479	64.31%	64573943	42163878	65.30%
UK-EC(6) ⁶	44738026	31902906	71.31%	44738026	33978945	75.95%
UK-RW3 ⁷	11801633	9655997	81.82%	11801633	10397157	88.10%

1 The Table is based on three-digit SITC data obtained from Series C Trade by Commodities, published by the OECD. UK import and export data were used.

2 The change in the amount of intra industry trade uncorrected.

3 The change in the amount of intra industry trade corrected.

4 W = world.

5 R/W = world less EC(6).

6 EC(6) = West Germany, France, Italy, Belgium/Luxemburg, Holland.

7 RW3 = United States, Canada, Japan.

They found that intra industry trade accounted for 70.90% of the increase in intra EC trade.

There is, however, little evidence to suggest that the share of intra industry trade in the increase in total trade with the EC(6) can be explained by UK entry into the EC.

The share of intra industry trade in the change in total trade between the UK and the world, and the UK and RW3, was substantially higher than the share of intra industry trade in the change in total trade between the UK and the EC(6), when either corrected, or uncorrected, estimates of intra industry trade were used; whilst the share of intra industry trade in the change in total trade with the rest of the world accounted for only 64.31% of the total change when uncorrected, and 65.30% when corrected. This smaller share can be explained by the inclusion of developing countries in the rest of the world.

According to intra industry trade theory, intra industry trade will form a relatively small proportion of the total trade of these countries²⁴. Inclusion of the latter will have the effect of reducing the share of intra industry trade in the increase in total trade.

These results suggest that intra industry trade with the EC(6) has not increased at a faster rate than intra industry trade with other industrial countries.

Whilst the evidence suggests that UK entry into the EC has not resulted in an increase in the proportion of intra industry trade, the theory of intra industry trade also predicts that enlargement will result in an increase in the amount of intra industry trade²⁵. In order to test this hypothesis the percentage change in UK total and intra industry trade with each of the trading groups between 1970/71 and 1978/79 was calculated. Both the corrected and uncorrected estimates are presented in Table 5.5.

The estimates in this Table highlight the rapid increase in total trade between the UK and the EC(6) which has occurred since UK entry. Thus total UK trade with the EC(6) grew nearly 100% faster than trade with any other trading group. This increase in total trade was almost matched by a 225.57% increase in intra industry trade between the UK and the EC(6) during the period after UK entry. The change in the amount of intra industry trade between the UK and the EC(6) can be compared with an increase of 124.72% in the amount of intra industry trade with RW3, and a 149.88% increase in the amount of intra industry trade with the rest of the world.

24 See chapter 1, p.28.

25 See chapter 1, p.30.

Table 5.5 The Percentage Change in Total and Intra Industry Trade in Manufactured Goods Between 1970/71 and 1978/79¹

	Δ in Total Trade	Δ in Intra ² Industry Trade	Δ in Intra ³ Industry Trade
UK-W ⁴	151.43%	201.58%	163.65%
UK-R/W ⁵	118.83%	149.88%	131.05%
UK-EC(6) ⁶	250.73%	225.57%	242.82%
UK-RW3 ⁷	78.54%	124.72%	131.92%

1 The Table is based on three-digit SITC data obtained from Series C Trade by Commodities, published by the OECD. UK import and export data were used.

2 The uncorrected percentage change in the amount of intra industry trade.

3 The corrected percentage change in the amount of intra industry trade.

4 W = world.

5 R/W = world less EC(6).

6 EC(6) = West Germany, France, Italy, Belgium/Luxemburg, Holland.

7 RW3 = United States, Canada, Japan.

These results are supported by the corrected estimates of intra industry trade presented in Table 5.5. The corrected estimates of the amount of intra industry trade between the UK and the EC(6) increased from 225.57% to 242.82%, whilst the corrected estimates of the increase in the amount of intra industry trade between the world and the rest of the world have declined substantially.

The post-entry period has, therefore, been marked by a rapid increase in the amount of intra industry trade between the UK and the EC(6). Since this increase has not been matched by a corresponding increase in the amount of intra industry trade between the UK and other trading groups, we can conclude that UK entry into the EC has resulted in an increase in the amount of intra industry trade between the UK and the EC(6).

Four conclusions can be drawn from the preceding discussion:

1. Intra industry trade accounts for over 70% of total trade with the EC(6) in 1970/71 and 1978/79, and the change in total trade with the EC(6) between 1970/71 and 1978/79. These estimates are in line with those obtained by other researchers for trade between industrial countries.
2. There is little evidence to suggest that EC enlargement has resulted in an increase in the proportion of intra industry trade in total trade between the UK and the EC(6). UK entry into the EC does not seem to have resulted in a change in the balance between intra and inter industry specialisation. This result supports an earlier finding by Owen²⁶ for the period 1970-75, and contradicts Grubel and Lloyd's prediction that trade liberalisation will result in an increase in the proportion of intra industry trade.
3. Whilst the proportion of intra industry trade in total trade with the EC(6) has remained approximately constant, the amount of intra industry trade between the UK and the EC(6) has grown at a much faster rate than the amount of intra industry trade between the UK and other trading groups. This finding supports the prediction that trade liberalisation will result in

26 Owen, N. 'Britain's Pattern of Specialisation', D.T.I. working paper, ref. L.T.W.G.(77).18.

an increase in the amount of intra industry trade²⁷.

4. Adjustment of the estimates of intra industry trade, in order to correct for trade imbalances, has a substantial impact on the estimates of intra industry trade. However, adjustment of the estimates does not affect the overall conclusions of the analysis.

Section III - Intra Industry Trade: The Model

As noted in chapter 1, the theory of intra industry trade suggests that the change in intra industry trade will be positively related to both the reduction in tariff barriers after UK entry into the EC²⁸ and the potential for intra industry trade in the i^{th} industry, measured by the degree of product differentiation²⁹. It will be negatively related to the height of non-tariff barriers³⁰.

Three additional variables are included in the estimated model. An industry dummy is defined in order to test Hufbauer and Chilas's³¹ contention that countries attempt to protect Heckscher-Ohlin industries after liberalisation through the erection of non-tariff barriers which are designed to encourage balanced trade³². The second variable, $secon_i$, is a measure of plant-level economies of scale.

This variable is expected to have a negative sign, since the existence

27 See chapter 1, p.30.

28 See chapter 1, p.29.

29 See chapter 1, p.29.

30 See chapter 1, p.30.

31 Hufbauer, G.C. and Chilas, J.C. 'Specialization by Industrial Countries: Extent and Consequences', in Giersch, H. (ed.) The International Division of Labour: Problems and Perspectives, International Symposium, Tübingen, 1974, pp.3-38.

32 See chapter 1, p.8.

of substantial economies of scale at the plant level will result in inter, rather than intra, industry specialisation³³. Finally, the industry definition used in this study does not correspond to the theoretical concept which underlies the theory of intra industry trade. As noted in chapter 2³⁴ the products within a three-digit SITC commodity group may have different factor intensities. The change in intra industry trade may, therefore, contain elements of both intra and inter industry specialisation. In order to control for this effect, a measure of industry heterogeneity (Agg_i) is included. The variable is expected to have a positive sign.

The basic model is shown in Equation 5.6.

Equation 5.6

$$\Delta IT_i = f(T_i, NTB_i, H_i, PD_i, Agg_i, Secon_i)$$

where:

- ΔIT = the change in intra industry trade
- T = tariffs
- NTB = non-tariff barriers
- H = an industry dummy which distinguishes between
Heckscher-Ohlin and other industries
- PD = product differentiation
- Agg = a measure of product heterogeneity
- $Secon$ = a measure of plant-level economies of scale

The analysis is based on two-year averages for the periods 1970/71 and 1978/79. The sample is made up of 93 three-digit SITC commodity groups drawn from the manufacturing sector, sections five to eight of the SITC³⁵.

33 See chapter 1, p.19.

34 See chapter 2, p.61.

35 For a detailed discussion of the sample selected and the period chosen for analysis, see chapter 3, pp.71-77.

The dependent variable (ΔIT_i). The analysis of the change in intra industry trade after UK entry into the EC is based on two measures of intra industry trade³⁶: firstly, the change in the amount of intra industry trade between the UK and the EC(6) in the i^{th} manufacturing commodity between 1970/71 and 1978/79 (Equation 5.7);

Equation 5.7

$$\Delta ITA_{ij} = \frac{\left(\left[(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}| \right]_{1978/79} - \left[(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}| \right]_{1970/71} \right)}{\left[(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}| \right]_{1970/71}}$$

where:

X = exports

M = imports

i = industry

j = country or trading group.

secondly, the proportion of intra industry trade in the total trade in the i^{th} manufacturing commodity group between the UK and the EC(6) in 1978/79 (Equation 5.8).

Equation 5.8

$$ITP_{ij} = \frac{\left[(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}| \right]_{1978/79}}{(X_{ij} + M_{ij})_{1978/79}}$$

When the latter variable is used, the proportion of intra industry trade in total UK trade with the EC(6) in the i^{th} commodity group in

³⁶ The derivation of these measures of intra industry trade is discussed in depth on pp.130-132.

1970/71 is included as an independent variable. The other independent variables then perform the function of explaining deviations from the proportion of intra industry trade found in 1970/71.

The change in the amount of intra industry trade between the UK and the EC(6) may reflect either the impact of UK entry into the EC, or a change in the pattern of demand for manufactured products in the industrial countries as a whole. In order to overcome this problem an additional independent variable, CRW - the change in the total imports of the i^{th} manufactured commodity into the United States, Canada and Japan between 1970/71 and 1978/79 - is included in the estimated equation when the change in the amount of intra industry trade is used as the dependent variable. The variable is expected to have a positive sign.

As noted above³⁷, the trade in manufactured goods between the UK and the EC(6) was not in balance in either the pre-entry or post-entry periods. Further, the size of this imbalance increased between 1970/71 and 1978/79. This implies that the industry estimates of the change in the proportion and the amount of intra industry trade will also be biased³⁸. The estimates of the proportion and amount of intra industry trade were, therefore, adjusted using the method developed by Aquino³⁹. The corrected measures of the proportion of intra industry trade and the change in the amount of intra industry trade are shown in Equations 5.9 and 5.10 respectively.

³⁷ See p.137.

³⁸ See chapter 2, p.58.

³⁹ Aquino, op. cit.

Equation 5.9

$$ITPC_{ij} = \frac{(a_j X_{ij} + b_j M_{ij}) - |a_j X_{ij} - b_j M_{ij}|}{(a_j X_{ij} + b_j M_{ij})}$$

where:

$$a_j = \frac{\sum_i (X_{ij} + M_{ij})}{2 \sum_i X_{ij}}$$

$$b_j = \frac{\sum_i (X_{ij} + M_{ij})}{2 \sum_i M_{ij}}$$

Both the corrected and uncorrected measures of intra industry trade are used in the analysis.

Equation 5.10

$$\Delta \text{ITAC}_{ij} = \left(\frac{\left[(a_{jij}^X + b_{jij}^M) - |a_{jij}^X - b_{jij}^M| \right] - \left[(a_{jij}^X + b_{jij}^M) - |a_{jij}^X - b_{jij}^M| \right]}{\left[(a_{jij}^X + b_{jij}^M) - |a_{jij}^X - b_{jij}^M| \right]} \right) \frac{1978/79}{1970/71}$$

where:

$$a_j = \sum_i (X_{ij} + M_{ij}) / 2 \sum_i X_{ij}$$

$$b_j = \sum_i (X_{ij} + M_{ij}) / 2 \sum_i M_{ij}$$

The independent variables

- a. Tariffs (T_i). Two variants of the tariff variable are specified and regressed on both the change in the amount and the change in the proportion of intra industry trade.

The first variable, TAR, represents the average height of EC(6) and UK tariffs in the i^{th} industry in 1971. It is defined as:

Equation 5.11

$$TAR_i = (TEC_{i, 1971} + TUK_{i, 1971}) / (2)$$

where:

TEC = common external tariff of the EC

TUK = external tariff of the UK

i = commodity 1 - 93

TEC_i and TUK_i represent unweighted averages of the eight-digit Brussels Tariff Nomenclature headings within each three-digit SITC commodity group.

A positive relationship is expected between TAR and the change in the amount of intra industry trade, since a reduction in the height of tariff barriers should increase the opportunities for trade in differentiated products⁴⁰.

The relationship between TAR and the change in the proportion of intra industry trade in the i^{th} commodity group is less clear⁴¹.

If the reduction in tariffs is to result in an increase in the

⁴⁰ See chapter 1, p.30.

⁴¹ This point was first raised by Caves, op. cit., with reference to a cross-section study of intra industry trade.

proportion of intra industry trade, the initially smaller trade flow in the pre-entry period must increase as a proportion of total trade in the commodity. Yet if both the EC and the UK levy a 10% tariff on imports of the i^{th} commodity in the pre-entry period it is unclear why the removal of the tariffs should result in the relatively faster growth of the smaller trade flow.

TAR should not, therefore, be significantly related to the change in the proportion of intra industry trade, although the change in the amount of intra industry trade will be positively related to TAR_i as long as TUK_i and TEC_i are greater than zero.

The second tariff variable measures the degree of similarity between UK and EC tariffs in the i^{th} industry. The specification of the variable is shown in Equation 5.12⁴².

Equation 5.12

$$TD_{i71} = \left[(TUK_i + TEC_i) - |TUK_i - TEC_i| \right] / (TUK_i + TEC_i) \quad 1971 \quad 1971$$

TD_i will be equal to one when the tariff barriers in the i^{th} industry are identical, and will approach zero as they become increasingly dissimilar.

It is hypothesised that TD_i will be positively related to the change in both the amount and the proportion of intra industry trade if the trade balances in 1970/71 are uncorrelated with TD_i ⁴³.

This expectation is based on a simulation in which UK-EC trade is assumed to be balanced in the initial period with imports

42 This formulation of the variable was first suggested by Pagoulatos and Sorenson, op. cit.

43 The zero order correlation between the trade balance in 1970/71 and TD_i was equal to .07.

into the UK and the EC each being equal to 100. An import price elasticity of 1 is assumed. Two cases are considered. In the first case the import tariff is equal to 10% for both the UK and the EC. In the second case the import tariff for the EC is equal to 5% and for the UK 15%. This produces an average tariff of 10% in both cases.

Case I			Case II		
	UK Imports	EC Imports		UK Imports	EC Imports
70.71	100	100	70.71	100	100
78.79	110	110	78.79	115	105

In case I the amount of intra industry trade increases by 10%, whilst the proportion remains constant. In the second case the amount of intra industry trade increases by 5%, whilst the proportion falls to 95.46%. This implies that the change in the amount and proportion of intra industry trade will be positively related to the degree of tariff similarity⁴⁴.

- b. Non-tariff barriers (NTBs). Two types of NTB can be isolated within the context of the enlarged EC: external NTBs which discriminate against the importation of commodities from non-member countries, and internal NTBs which discriminate against imports from other

44 This prediction can be contrasted with the relationship between TD_1 and the proportion of intra industry trade, in a cross-section analysis predicted by Caves, op. cit., and Pagoulatos and Sorenson, op. cit. This inconsistency can be explained by the respective assumptions which underlie the analysis. Thus Caves assumes that the imposition of a tariff is independent of the initial trade balance, whilst in this study the trade balance in 1970/71 is assumed to be independent of the tariff structure in 1970/71.

member countries as well as non-member countries.

During the post-UK entry period there would appear to have been a substantial increase in the incidence of EC non-tariff barriers. Thus Page⁴⁵ has suggested that the percentage of EC(9) trade in manufactured products, which is managed, increased from 0.1% in 1974 to 15.7% in 1979. However, the relative growth of internal and external NTBs cannot be ascertained from the data presented by Page.

According to the theory of intra industry trade the incidence of intra industry trade will be negatively related to the height of internal NTBs⁴⁶. The removal of NTBs on UK and EC(6) intra trade during the post-entry period should, therefore, have resulted in an increase in intra industry trade between the UK and the EC during the post-entry period. Thus the change in UK-EC intra industry trade should be positively related to the height of NTBs in the pre-entry period.

However, Page's results suggest firstly that EC(9) NTBs on manufactured goods were small or insignificant in the pre-entry period, and secondly that enlargement has coincided with a substantial increase in EC(9) NTBs on manufactured goods. To the extent that this general increase in EC NTBs is reflected in an increase in internal NTBs, the growth of NTBs during the post-enlargement period should, ceteris paribus, result in a decrease in the incidence of intra industry trade between the UK and the EC.

45 Page, S.A.B. 'The Revival of Protectionism and its Consequences for Europe', Journal of Common Market Studies, Vol. XX, No. 1, 1981, pp.17-40.

46 See chapter 1, p.30.

In contrast, Hufbauer and Chilas⁴⁷ have argued that whilst specialisation is tolerated in product cycle and Ricardo industries, countries are unwilling to embrace specialisation in Heckscher-Ohlin industries. In this case the imposition of non-tariff barriers may be designed to encourage intra industry trade and balanced trade within industries rather than inter industry specialisation. Thus the level of intra industry trade in Heckscher-Ohlin industries may be artificially high if the members of the enlarged EC protect these industries with subsidies or non-tariff barriers in order to minimise the adjustment effects of tariff liberalisation within the EC.

This implies that the incidence of intra industry trade will be positively related to the height of NTBs. Further, the imposition of internal NTBs will have the effect of encouraging intra industry trade. However, whilst a positive relationship between the incidence of NTBs and the proportion of intra industry trade is predicted, the relationship between NTBs and the amount of intra industry trade is less clear, since the imposition of internal NTBs should, if anything, result in a fall in total trade and intra industry trade between the UK and the EC(6).

The imposition of external NTBs by the members of the Community will have the effect of increasing the price of imports from non-members relative to EC suppliers. This should result in trade diversion from non-members to members of the EC and an increase in intra Community trade. Since some proportion of this increase in Community trade will take the form of intra industry trade, a

47 Hufbauer and Chilas, op. cit.

positive relationship between the level and the change in level of NTBs and the amount and change in amount of intra industry trade is predicted. No prediction is made with respect to the relationship between the proportion of intra industry trade and the imposition of external NTBs.

Specification of the non-tariff variable was hampered by the absence of a satisfactory data base. The quality of the available data precluded the definition of continuous variables or the isolation of changes in internal and external tariffs.

In order to test the relationship between the incidence of NTBs and changes in the amount and proportion of intra industry trade, two dummy variables were defined H and NTB.

H was obtained by dividing the three-digit SITC commodity groups into Heckscher-Ohlin, product cycle and Ricardo industries, following the classification developed by Hufbauer and Chilas. A dummy variable was then defined with Heckscher-Ohlin industries equal to one, and other industries equal to zero. A positive relationship between this variable and the amount of intra industry trade would provide support for the hypothesis developed by Hufbauer and Chilas. A negative or insignificant relationship would support the predictions of intra industry trade theory.

The second dummy variable, NTB, was based on data developed by Page⁴⁸. Those three-digit SITC industries which Page defined as managed were given a value of one, and all other industries zero. To the extent that the variable reflects the imposition of external non-tariff barriers, a positive relationship was expected between

48 Page, op. cit.

the incidence of NTBs and the change in the amount of intra industry trade.

In addition to the institutional and legal non-tariff barriers outlined above, the pattern of intra industry trade will also be partly determined by inter industry differences in transport costs. Two effects were isolated in chapter 1. In the first case it was argued that a negative relationship between transport costs and the amount of intra industry trade could be predicted⁴⁹, since transport costs represent one type of non-tariff barrier. In the second case it was argued that intra industry trade may arise as a consequence of border trade in commodities with substantial costs of transportation⁵⁰. In this case a positive relationship between transport costs and intra industry trade may be predicted.

These effects are, however, likely to be small. The substantial geographical barrier imposed by the Channel should preclude the possibility of border trade in manufactured commodities with heavy transport costs between the UK and the EC(6). In addition, results generated by Edwards⁵¹ and Bayliss and Edwards⁵² suggest that transport costs form a very small proportion of the sale price of manufactured goods. In the light of these results relative transport costs were not included within the estimated model.

49 See chapter 1, p.23.

50 See chapter 1, pp.21-22.

51 Edwards, S.L. 'Transport Cost in British Industry', Journal of Transport Economics and Policy, September 1970, pp.265-77.

52 Bayliss, B.T. and Edwards, S.L. Industrial Demand for Transport, HMSO, 1970.

c. Product differentiation (PD). Product differentiation will result in intra industry trade when home-based companies are unable to supply the differentiated import at a competitive price. Some consumers may then choose to buy the bundle of characteristics contained within the imported good rather than the home-produced good.

The discussion in chapter 1 suggested that this situation may arise for two reasons⁵³. Firstly, the exporter may be able to take advantage of economies of batch, or long-run, production which are not available to the home producer. These economies may be a product of commodity complexity⁵⁴ and representative demand⁵⁵. Secondly, even where such economies do not exist, the imported commodity may possess product specific characteristics which cannot be matched by the home-produced good. These characteristics may arise as a consequence of R & D and advertising expenditure, and will be protected by trade-marks, patents and barriers to entry imposed by past advertising expenditure⁵⁶. Caves⁵⁷ has argued that not only the opportunity for product differentiation but also its source will determine the level of intra industry trade. He argues that whilst differentiation on the basis of economies of large batch production,

53 See chapter 1, pp.25-27.

54 For a discussion of this point see Caves, op. cit.

55 See Linder, S.B. An Essay on Trade and Transformation, New York, 1961.

56 For a discussion of the relationship between advertising and barriers to entry see Cowling, K. and Cubbin, J. 'Price Quality and Advertising Competition', Economica, Vol. 38, 1971, pp.378-94.

57 Caves, op. cit.

or knowledge, will encourage intra industry trade, product differentiation on the basis of advertising will not do so, since advertising may be country specific.

The measure of product differentiation used in this study is based on a series of data developed by Hufbauer⁵⁸. PD is defined as the coefficient of variation of US export unit values for shipments of the products to various importing countries in 1963. When the variation is small it assumed that the products are relatively standardised, higher values imply a greater degree of product differentiation.

The variable should be positively related to the change in the amount and proportion of intra industry trade. In effect the variable is used as a measure of the potential for intra industry trade in the i^{th} industry.

Ideally the variable should have been constructed on the basis of UK and EC trade data. A measure of product differentiation in UK and EC industries could then have been compiled. However, the data collection and collation task involved could not have been carried out within the constraints imposed on this study.

Whilst it might have been desirable to collect data on the industry characteristics which underlie product differentiation, this was precluded by the problems of matching the industry and trade nomenclatures at this level of aggregation⁵⁹ and the absence

58 Hufbauer, G.C. 'The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods', in Vernon, R. (ed.) The Technology Factor in International Trade, Universities - National Bureau Conference Series, 22, New York, 1970, pp.145-231.

59 For a discussion of these problems see chapter 3, pp.78-80. See Gray, H.P. and Martin, J.P. 'The Meaning and Measurement of Product Differentiation in International Trade', Weltwirtschaftliches Archiv, Vol. 116, 1980, pp.322-29, for a general criticism of Hufbauer's measure.

of a satisfactory data source for the candidate variables. Thus in the case of economies of scale it would not have been adequate simply to collect data at the industry level since the source of intra industry trade lies in economies of batch or long-run production rather than the height of plant- or firm-level economies of scale. This implies that the relationship between the source of product differentiation and the change in intra industry trade between the UK and the EC(6) cannot be investigated within this study.

- d. Product heterogeneity. The SITC three-digit commodity group is an imperfect proxy for the concept of an industry implicit in the theory of intra industry trade. It may contain a number of heterogeneous product groups. This suggests that some proportion of the intra industry trade, within a specified three-digit commodity group, may be explained by differences in factor intensity and will thus reflect inter industry specialisation rather than intra industry trade⁶⁰.

In order to overcome this problem, two measures of industry heterogeneity have been defined:

SITC5 = the number of five-digit SITC positions within each three-digit SITC commodity group

BTN8 = the number of eight-digit Brussels Tariff Nomenclature headings within each three-digit SITC commodity group.

60 For a detailed discussion of the problems of industry definition and categorical aggregation see chapter 2, pp.60-63.

SITC5 was selected because the five-digit level of the SITC corresponds roughly to the concept of an industry group. The eight-digit level of the Brussels Tariff Nomenclature was selected because it identifies the individual product within which product differentiation may take place.

The two variables are expected to be positively related to the change in both the amount and proportion of intra industry trade. A positive significant coefficient would imply that some proportion of the change in intra industry trade could be explained by differences in factor proportions or factor intensities within industries, rather than by the growth in intra industry trade.

- e. Economies of scale. This variable is defined as the slope coefficient from a logarithmic regression (computed across size classes of establishments in each industry) of value added per worker on plant size in US industries in 1963. This variable is Hufbauer's proxy for economies of scale⁶¹. US data are relevant to this study because they show optimum plant size, in a market which is of equivalent size to the EC but unimpeded by tariff barriers. In this case US plant sizes may reflect optimum plant sizes in an enlarged EC unimpeded by tariff barriers.

This variable is expected to be negatively related to the change in both the amount and the proportion of intra industry trade between the EC and the UK⁶². In effect, inter industry specialisation is expected to take place in those industries with extensive economies of scale.

61 Hufbauer, op. cit.

62 See chapter 1, pp.19-20.

Section IV - Intra industry trade: the regression results

- a. The change in the proportion of intra industry trade. The regression estimates of the determinants of the uncorrected proportion of intra industry trade (ITP_{79}) within 92 three-digit SITC manufacturing commodities in 1978/79⁶³, are presented in Table 5.6.

Whilst the degree of explanation provided by the model is not high, with R^2 lying between 0.12 and 0.38, it is comparable with the degree of explanation provided by other cross-section studies of intra industry trade⁶⁴. The F statistic is significant at the 1% level in all cases. Examination of the zero-order correlation matrix (Table 5.7) suggested that multicollinearity did not present a serious problem in this study.

Both SITC5, and PD, have the expected positive signs and are significant at the 5% level in equations 1 to 5. This implies that the proportion of intra industry trade is positively related to the incidence of product heterogeneity, and the degree of product differentiation, within three-digit commodity groups. This finding adds support to the earlier results of Loertscher and Wolter⁶⁵, Pagoulatos and Sorenson⁶⁶ and Caves⁶⁷. The degree of explanation provided by these variables is not, however, high. Thus PD and SITC5 only account for 12% of the variation in the dependent variable.

The number of Brussels Tariff Nomenclature headings in each

63 SITC 561 (Manufactured Fertilisers) was excluded from the initial sample of 93 manufacturing commodities throughout the regression analysis. The commodity group accounts for a very small proportion of UK exports to the EC(6), 0.22%, but acts as a substantial outlier.

64 See for example: Caves, op. cit.; Pagoulatos and Sorenson, op. cit.; and Toh, op. cit.

65 Loertscher and Wolter, op. cit.

66 Pagoulatos and Sorenson, op. cit.

67 Caves, op. cit.

Table 5.6 Regression Estimates of the Determinants of the Proportion of Intra Industry Trade in 1978/79 n = 92

Eq.	DV	Const.	SITC5	Secon	PD	TAR	TD	NTB	H	BTN8	ITP ₇₀	R ²	F Stat.
1	ITP ₇₉	0.546 0.202	0.005 0.002+		0.145 0.062+							0.12	5.81*
2	ITP ₇₉	0.191 0.197	0.005 0.002+		0.164 0.061*	0.013 0.007§	0.275 0.139§					0.18	4.82*
3	ITP ₇₉	0.193 0.198	0.005 0.002+		0.161 0.062+	0.013 0.007§	0.276 0.140§	-0.101 0.051				0.18	3.82*
4	ITP ₇₉	0.154 0.198	0.005 0.002+		0.174 0.063*	0.012 0.007§	0.288 0.140+	-0.022 0.053	0.047 0.047			0.19	3.35*
5	ITP ₇₉	0.159 0.199	0.006 0.003+	0.186 0.245	0.171 0.064*	0.011 0.007	0.292 0.141+	-0.023 0.053	0.042 0.048			0.20	2.94*
6	ITP ₇₉	0.389 0.179									0.471 0.076*	0.30	38.97*
7	ITP ₇₉	0.319 0.176	0.003 0.002		0.093 0.055§						0.423 0.078*	0.34	14.98*
8	ITP ₇₉	0.081 0.174	0.003 0.002		0.110 0.055+	0.008 0.006	0.216 0.123§				0.396 0.078*	0.37	10.06*
9	ITP ₇₉	0.084 0.175	0.003 0.002		0.107 0.056+	0.008 0.006	0.217 0.124§	-0.013 0.045			0.396 0.079*	0.37	8.31*
10	ITP ₇₉	0.062 0.175	0.003 0.002		0.118 0.057+	0.007 0.006	0.222 0.124§		0.023 0.041		0.392 0.079*	0.37	8.37*
11	ITP ₇₉	0.063 0.176	0.003 0.002		0.115 0.057+	0.007 0.006	0.225 0.125§	-0.020 0.047	0.021 0.042		0.391 0.079*	0.37	7.13*
12	ITP ₇₉	0.068 0.176	0.003 0.002	0.140 0.217	0.113 0.058§	0.006 0.006	0.228 0.126§	-0.020 0.047	0.024 0.042		0.389 0.080	0.38	6.25*

§ = significant at the 10% level, + = significant at the 5% level, * = significant at the 1% level

Table 5.7 Intra Industry Trade Zero Order Correlation Matrix n = 92

	Δ ITAC	Δ ITA	Δ ITC	Δ IT	ITPC ₇₉	ITPC ₇₀	ITPC ₇₉	ITPC ₇₀	SITC	Secon	PD	TAR	TD	NTB	H	BTN8	CRW
Δ ITAC	-																
Δ ITA	0.94	-															
Δ ITC	0.47	0.45	-														
Δ IT	0.41	0.49	0.94	-													
ITPC ₇₉	-0.02	-0.04	-0.18	-0.25	-												
ITPC ₇₀	-0.41	-0.42	-0.61	-0.63	0.70	-											
ITPC ₇₉	-0.02	0.10	-0.18	-0.13	0.87	0.60	-										
ITPC ₇₀	-0.39	-0.43	-0.60	-0.65	0.69	0.98	0.55	-									
SITC	-0.16	-0.17	-0.10	-0.13	0.31	0.23	0.25	0.24	-								
Secon	0.03	0.05	-0.08	-0.10	0.06	0.08	0.09	0.07	-0.10	-							
PD	-0.27	-0.26	-0.13	-0.15	0.27	0.21	0.26	0.19	0.09	0.00	-						
TAR	0.14	0.17	-0.24	-0.23	0.16	0.19	0.18	0.17	0.11	0.22	-0.07	-					
TD	0.29	0.25	0.19	0.17	0.16	0.05	0.16	0.07	0.03	-0.07	-0.08	-0.08	-				
NTB	0.26	0.18	0.19	0.08	0.08	-0.04	-0.05	-0.01	-0.00	0.06	-0.20	0.10	0.03	-			
H	0.24	0.17	0.06	-0.05	0.10	-0.01	-0.01	0.01	-0.23	0.20	-0.26	0.19	-0.08	0.27	-		
BTN8	-0.14	-0.14	-0.11	-0.14	0.29	0.22	0.25	0.22	0.72	-0.12	0.16	0.23	0.07	0.06	-0.21	-	
CRW	0.31	0.29	0.33	0.27	-0.00	-0.13	-0.01	-0.14	-0.12	-0.09	-0.09	-0.05	0.04	-0.09	0.10	-0.14	-

three-digit SITC commodity group (BTN8) was considered as an alternative measure of product heterogeneity. This variable was discarded, both because it was highly correlated with SITC5 ($r = .70$), and because SITC5 provided the best fit in all cases.

$ITPC_{70}$, the uncorrected proportion of intra industry trade within the i^{th} industry in 1970/71, is included in equations 6 to 12. The variable is positive and significant at the 1% level. Inclusion of the variable results in a substantial increase in the level of explanation provided by the model and the significance of the F statistic. The proportion of intra industry trade in the i^{th} industry in 1978/79 is, therefore, fairly highly correlated with the incidence of intra industry trade in 1970/71 ($r = .55$).

Addition of $ITPC_{70}$ to the set of independent variables has a substantial impact on the estimated coefficients and significance levels of the other independent variables. Thus SITC5 is significant and positive at the 5% level in all of the equations where $ITPC_{70}$ is excluded. When $ITPC_{70}$ is included, the estimated coefficient for SITC5 falls from .005 to .003 and becomes insignificant at the 10% level. A marked change in the estimated coefficient for PD can also be observed, but the coefficients remain significant whether $ITPC_{70}$ is excluded or included.

These results suggest that whilst product heterogeneity within three-digit commodity groups may explain some proportion of the level of intra industry trade in any given year, it does not explain the change in the proportion in the post-enlargement period. Thus changes in the proportion of intra industry trade in the post-enlargement period do not appear to arise as a consequence of

categorical aggregation and inter industry specialisation within three-digit commodity groups.

Product differentiation, on the other hand, is positively related to both the proportion and the change in proportion of intra industry trade. This finding supports the hypothesised relationships outlined in chapter 1⁶⁸.

The estimated coefficients of the tariff variables provide some support for the model outlined in the preceding section. When $ITPC_{70}$ is included in the estimated equation, the average height of UK and EC tariffs in the i^{th} industry in 1970/71 (TAR) is insignificant. TD, which measures the degree of similarity between UK and EC tariffs in the i^{th} industry in 1970/71, is positive and significant at the 10% level. This implies that it is not the height of tariff barriers in the pre-entry period which determines the change in the proportion of intra industry trade, but rather the distribution of those tariffs between the trading partners. The more similar are the tariff barriers in the pre-entry period, the more likely is the proportion of intra industry trade to increase. Some doubt must, however, be cast on this interpretation, in the light of the relatively low level of significance attached to TD.

Inclusion of the two dummy variables, H and NTB, which represent proxies for the incidence of non-tariff barriers, resulted in a fall in the overall significance of the equation, and little, or no, increase in the level of explanation provided by the model. Neither of the variables was significant at the 10% level, and inclusion of H and NTB had little effect on the estimated coefficients or significance of the other independent variables.

⁶⁸ See chapter 1, p.29.

Whilst the insignificance of NTB may be explained in the context of the earlier theoretical discussion⁶⁹, a positive relationship between H and the change in the proportion of intra industry trade was expected. The insignificance of this variable suggests that there is little evidence to support the contention that NTBs are designed to encourage balanced trade, within politically sensitive Heckscher-Ohlin industries.

Finally, the insignificance of $Secon$ at the 10% level implies that the period since EC enlargement has not been characterised by inter industry specialisation in those industries which are characterised by substantial economies of scale.

The estimated coefficients of the determinants of the corrected proportion of intra industry trade ($ITPC_{79}$) within 92 three-digit SITC manufacturing commodities in 1978/79, are presented in Table 5.8.

Both the degree of explanation provided by the model, and the significance of the F statistic, are substantially higher than those obtained when the uncorrected proportion of intra industry trade, ($ITPC_{79}$), is used as the dependent variable. This is true whether $ITPC_{70}$, the corrected proportion of intra industry trade in the i^{th} industry in 1970/71, is included or excluded from the estimated equation.

In the absence of $ITPC_{70}$ (equations 1 to 5), $SITC5$ and PD are both positive and significant at the 1% level. As in the case of the unadjusted estimates, inclusion of $ITPC_{70}$ has a substantial impact on the size of the estimated coefficients and their

69 See pp.153-157.

Table 5.8 Regression Estimates of the Determinants of the Adjusted Proportion of Intra Industry Trade in 1978/79 n = 92

Eq.	DV	Const.	SITC5	Secon	PD	TAR	TD	NTB	H	BTN8	ITPC ₇₀	R ²	F Stat.
1	ITPC ₇₉	0.241 0.181	0.006 0.002*		0.155 0.056*	0.010 0.006§	0.253 0.128§					0.21	5.72*
2	ITPC ₇₉	0.227 0.181	0.006 0.002*		0.169 0.057*	0.010 0.006	0.249 0.128§	0.059 0.047				0.22	4.92*
3	ITPC ₇₉	0.150 0.176	0.007 0.002*		0.189 0.056*	0.007 0.006	0.278 0.125†		0.102 0.041†			0.26	6.09*
4	ITPC ₇₉	0.148 0.177	0.007 0.002*		0.195 0.057*	0.007 0.006	0.274 0.125†	0.034 0.047	0.095 0.042†			0.27	5.14*
5	ITPC ₇₉	0.150 0.178	0.007 0.002*	0.060 0.219	0.194 0.057*	0.007 0.006	0.275 0.126†	0.034 0.047	0.093 0.043†			0.27	4.37*
6	ITPC ₇₉	0.328 0.144									0.576 0.062*	0.49	85.62*
7	ITPC ₇₉	0.271 0.140	0.003 0.0017†		0.070 0.043						0.527 0.063*	0.53	32.39*
8	ITPC ₇₉	0.097 0.138	0.003 0.0017§		0.081 0.043§	0.003 0.005	0.192 0.098§				0.513 0.064*	0.55	20.66*
9	ITPC ₇₉	0.081 0.137	0.003 0.0017§		0.095 0.044†	0.002 0.004	0.187 0.097§	0.063 0.035§			0.515 0.063*	0.56	18.19*
10	ITPC ₇₉	0.243 0.133	0.004 0.002†		0.111 0.043†	0.0003 0.005	0.214 0.095†		0.085 0.031*		0.501 0.062*	0.58	19.80*
11	ITPC ₇₉	0.021 0.133	0.004 0.002§		0.118 0.044*	0.000 0.005	0.209 0.095†	0.044 0.035	0.076 0.032†		0.504 0.062*	0.59	17.29*
12	ITPC ₇₉	0.021 0.134	0.004 0.002†	-0.017 0.165	0.118 0.044*	0.000 0.005	0.208 0.095†	0.044 0.036	0.077 0.032†		0.504 0.062*	0.59	14.95*

§ = significant at the 10% level, † = significant at the 5% level, * = significant at the 1% level

significance. The estimated coefficients of both SITC5 and PD fall by 50% and the significance levels show a noticeable decline. Thus the estimated coefficients for PD are now significant at the 5%, rather than the 1%, level, while the coefficients for SITC5 are intermittently significant at the 5%, or 10%, level, depending on the composition of the function.

The significance levels attached to both PD and SITC5 are, therefore, appreciably higher when $ITPC_{79}$ is used as the dependent variable rather than ITP_{79} . This remains true whether the proportion of intra industry trade in 1970/71 is used as an independent variable or not.

The adjusted results imply that SITC5 is positively related not only to the level of intra industry trade, but also to the change in the proportion of intra industry trade since EC enlargement. Thus some proportion of the change in the proportion of intra industry trade, as well as the level, can be explained by categorical aggregation and inter industry specialisation within three-digit SITC commodity groups. Similarly, the positive sign on PD implies that the level, and change in proportion, of intra industry trade is positively related to the incidence of product differentiation. However, whilst PD and SITC5 are significant and positive, inclusion of these variables only contributes minimally to the explanation of the change in the proportion of intra industry trade. R^2 increases from 0.49 to 0.53, while the F statistic falls from 85.62 to 32.39.

As expected, TAR is positive but insignificant at the 10% level, whether $ITPC_{70}$ is included or excluded. TD is positive and

significant at the 5% level when the industry dummy, H , is included. Inclusion of $ITPC_{70}$ has little effect on the level of significance, but results in a reduction in the size of the estimated coefficient. This result provides additional support for the contention that the change in the proportion of intra industry trade is positively related to the degree of tariff similarity before EC enlargement, rather than the height of tariffs⁷⁰.

Inclusion of the two dummy variables, which represent non-tariff barriers, results in a small increase in the degree of explanation provided by the model. R^2 increases by about .04. NTB is positive but insignificant. This result adds support to the relationship between NTB and the unadjusted estimates of the proportion of intra industry trade, found in the previous section.

Adjustment of the dummy variable has a marked effect on the significance of the Heckscher-Ohlin industry dummy H . The variable is consistently positive and significant at the 5% level when $ITPC_{79}$ is used as the dependent variable. This implies that the proportion of intra industry trade in Heckscher-Ohlin industries has risen, relative to product cycle, or Ricardo, industries during the post-enlargement period. This result adds some support to the hypothesis proposed by Hufbauer and Chilas⁷¹, and suggests that non-tariff barriers may have acted as a mechanism by which balanced trade has been encouraged or maintained in Heckscher-Ohlin industries.

⁷⁰ See pp.151-152.

⁷¹ Hufbauer and Chilas, op. cit.

Finally, Secon was not significantly different from zero at the 10% level, and does not contribute towards the degree of explanation provided by the model. This confirms the result derived in the previous section⁷².

Overall the results presented in Table 5.6 and 5.8 provide some support for the model of intra industry trade which has been outlined in the preceding chapters. PD and ITP₇₀ have the expected signs, and are significantly different from zero, when either the adjusted or the unadjusted versions of the dependent variable is used. SITC5 is, as predicted, positively related to both the proportion and the change in proportion of intra industry trade, although better results were obtained for the adjusted, rather than the unadjusted, version of the dependent variable. The estimated coefficients of the tariff variables provide support for the belief that the distribution of tariffs, rather than their height, determines the change in the proportion of intra industry trade after liberalisation. Finally NTB was, as expected, insignificant, whilst H was significant when the adjusted version of the dependent variable was used.

- b. The change in the amount of intra industry trade. The estimated coefficients of the determinants of the uncorrected change in the amount of intra industry trade within 92 three-digit SITC manufacturing commodities between 1970/71 and 1978/79 are presented in Table 5.9.

The degree of explanation is, again, rather low, with R^2

⁷² See p.167.

Table 5.9 Regression Estimates of the Determinants of the Change in the Amount of Intra Industry Trade Between 1970/71 and 1978/79 n = 92

DV	Const.	SITC5	Secon	PD	TAR	TD	NTB	H	BTN8	CRW	R ²	F Stat.
Δ ITA	0.669 1.935	-0.042 0.023§		-1.279 0.594†	0.132 0.066†	3.563 1.366†					0.18	4.82*
Δ ITA	-0.239 1.866	-0.035 0.022		-1.155 0.575†	0.138 0.064†	3.446 1.319†				0.558 0.204*	0.25	5.65*
Δ ITA	0.529 1.931	-0.042 0.023§		-1.144 0.604§	0.125 0.066§	3.522 1.364†	0.582 0.500				0.19	4.15*
Δ ITA	-0.466 1.853	-0.035 0.022		-0.978 0.583§	0.130 0.063†	3.388 1.309†	0.730 0.483			0.591 0.204*	0.27	5.16*
Δ ITA	0.419 1.942	-0.038 0.024		-1.185 0.615§	0.124 0.067§	3.632 1.375*		0.281 0.449			0.19	3.91*
Δ ITA	-0.409 1.875	-0.032 0.023		-1.089 0.595§	0.132 0.065†	3.497 1.329*		0.203 0.435		0.552 0.205*	0.25	4.70*
Δ ITA	0.389 1.941	-0.039 0.024		-1.097 0.620§	0.121 0.067§	3.567 1.376†	0.538 0.517	0.170 0.462			0.20	3.44*
Δ ITA	-0.504 1.863	-0.034 0.023		-0.965 0.598	0.129 0.065†	3.402 1.323†	0.717 0.500	0.050 0.445		0.589 0.206*	0.27	4.37*
Δ ITA	-0.495 1.874	-0.033 0.023	0.639 2.322	-0.974 0.602	0.125 0.067§	3.413 1.331†	0.717 0.503	0.031 0.453		0.595 0.208*	0.27	3.79*

§ = significant at the 10% level

† = significant at the 5% level

* = significant at the 1% level

varying between 0.16 and 0.27. The F statistic is, however, significant at the 1% level in all cases.

CRW, the change in total imports of the 1th manufactured commodity into the United States, Canada and Japan, has the expected sign and is significant at the 1% level. Inclusion of the variable adds substantially to the degree of explanation provided by the model, but does not affect the sign or significance of the other independent variables. This suggests that changes in the amount of intra industry trade between the UK and the EC(6) are not simply a reflection of changes in the pattern of demand for manufactured products in the industrial countries.

SITC5 is negative and insignificant at the 10% level in nearly all cases. This suggests that the change in the amount of intra industry trade is not related to the degree of product heterogeneity within three-digit SITC commodity groups. The increase in the amount of intra industry trade between the UK and the EC(6) does not, therefore, simply reflect inter industry trade and specialisation within three-digit SITC commodity groups.

PD, the measure of product differentiation, is negative and intermittently significant at the 5% and 10% levels. This is the opposite sign from that predicted by the theory⁷³. The negative sign implies that the amount of intra industry trade has increased fastest in those industries in which the opportunities for product differentiation are slight. The change in the level of significance when the non-tariff barrier dummies are introduced into the estimated equation, suggests that this surprising result may arise as

⁷³ See chapter 1, p.30.

a consequence of an omission of variables problem.

Both of the tariff variables have the expected signs. TAR is positive and significant at the 5% or 10% level, and TD is positive and significant at the 1% or 5% level. These results imply that the change in the amount of intra industry trade is positively related to both the height and similarity of UK-EC tariffs in the pre-entry period. Inclusion of the non-tariff barrier dummies has little effect on the level of significance, or the estimated coefficients, of the tariff variables.

The non-tariff barrier dummies, H and NTB, are positive but are not significantly different from zero at the 10% level. Inclusion of these variables results in a small increase in the degree of explanation provided by the model, but a substantial fall in the F statistic. The insignificance of the Heckscher-Ohlin industry dummy, H, was predicted by the theory. However, the insignificance of NTB suggests that the results do not support the contention that the increase in the external non-tariff barriers of the EC since enlargement has resulted in an increase in the amount of intra industry trade between the UK and the EC(6).

Secon was not significant at the 10% level.

The estimated coefficients of the determinants of the corrected change in the amount of intra industry trade within 92 three-digit SITC manufacturing commodities between 1970/71 and 1978/79 ($\Delta ITAC$) are presented in Table 5.10.

Both the degree of explanation provided by the model and the F statistics are considerably higher than for the equations estimated with ΔITA , the unadjusted change in intra industry trade, as

Table 5.10 Regression Estimates of the Determinants of the Adjusted Change in the Amount of Intra Industry Trade
Between 1970/71 and 1978/79 n = 92

DV	Const.	SITC5	Secon	PD	TAR	TD	NTB	H	BTN8	CRW	R ²	F Stat.
ΔITAC	0.629 1.863	-0.038 0.022§		-1.326 0.572†	0.110 0.063§	3.984 1.316*					0.20	5.34*
ΔITAC	-0.299 1.787	-0.031 0.022		-1.199 0.551†	0.117 0.061§	3.864 1.263*				0.571 0.195*	0.27	6.36*
ΔITAC	0.396 1.830	-0.038 0.022§		-1.100 0.573§	0.099 0.063	3.916 1.293*	0.973 0.474†				0.24	5.27*
ΔITAC	-0.652 1.735	-0.031 0.021		-0.926 0.546§	0.104 0.059§	3.775 1.227*	1.129 0.452†			0.622 0.191*	0.32	6.66*
ΔITAC	0.008 1.828	-0.032 0.023		-0.971 0.585	0.086 0.064	4.039 1.297*	0.852 0.487§	0.468 0.435			0.25	4.60*
ΔITAC	-0.912 1.739	-0.026 0.022		-0.835 0.557	0.095 0.061	3.869 1.234*	1.036 0.467†	0.345 0.415		0.607 0.192*	0.33	5.79*
ΔITAC	-0.912 1.749	-0.026 0.022	0.059 2.168	-0.836 0.562	0.095 0.062	3.870 1.242*	1.036 0.470†	0.343 0.423		0.607 0.194*	0.33	5.00*
ΔITAC	-0.011 1.838	-0.032 0.023	-0.668 2.265	-0.960 0.589	0.090 0.065	4.026 1.304*	0.853 0.490§	0.487 0.442			0.25	3.91*
ΔITAC	0.056 1.850	-0.029 0.023		-1.110 0.586§	0.091 0.064	4.142 1.311*		0.644 0.428			0.22	4.79*
ΔITAC	-0.774 1.778	-0.024 0.022		-1.014 0.564	0.100 0.062	4.006 1.261*		0.566 0.412		0.554 0.195*	0.29	5.67*

§ = significant at the 10% level

† = significant at the 5% level

* = significant at the 1% level

the dependent variable. The F statistic is significant at the 1% level in all cases.

CRW has the expected sign and is significant at the 1% level. Inclusion of the variable adds substantially to the degree of explanation provided by the model, but does not affect the sign or the significance of the other independent variables. These findings confirm the results obtained when ΔITA was used as the dependent variable.

SITC5 is negative, but insignificant at the 10% level. This implies that the increase in the adjusted amount of intra industry trade cannot be explained by the incidence of categorical aggregation.

A positive relationship between PD and the adjusted change in the amount of intra industry trade was predicted on the basis of the theory. The results suggest that PD is intermittently significant at the 5% and 10% levels but has a negative sign. This implies that the change in the amount of intra industry trade is inversely related to the degree of product differentiation. This result contradicts the predictions of the theory outlined in chapter 1.

Analysis of the results confirm the view, outlined in the previous section, that the negative significant sign may reflect an omission of variables problem. Inclusion of the non-tariff barrier dummies H and NTB reduces the significance of the estimates and the size of the coefficients. Thus inclusion of NTB reduces the estimated coefficient on PD from -1.326 to -1.150.

At the same time the significance of the estimate falls from the 5% to the 10% level. Similarly the inclusion of H results in a reduction in the estimated coefficient from -1.100 to -0.971. When H is included, PD is significant at the 10% level in only one case. This implies that the negative, significant sign on PD, in the absence of the non-tariff barrier variables, reflects the presence of industry specific non-tariff barriers, rather than the relationship between product differentiation and the change in the amount of intra industry trade.

TD is significant and positive at the 1% level. The variable does, therefore, have the expected sign. The more similar were UK-EC tariffs in the pre-entry period, the larger is the increase in the adjusted amount of intra industry trade. The second tariff variable, TAR, had the expected sign but was not significant at the 5% level. When H was included, TAR ceased to be significant at the 10% level. This result can be contrasted with the positive and significant sign found when TAR was regressed on the unadjusted change in the amount of intra industry trade.

NTB is positive and significant at the 5% level. Inclusion of the variable results in a small increase in R^2 (.04) and the F statistic. The variable does, therefore, contribute to the degree of explanation provided by the model. The positive sign on NTB suggests that the adjusted amount of intra industry trade has increased most rapidly in those industries in which NTBs are high. This finding can be contrasted with the prediction of intra industry trade theory that NTBs, as a barrier to trade, will discourage intra industry trade. However, the NTB variable probably reflects

external non-tariff barriers which have been erected since the enlargement of the EC, rather than internal barriers to trade between the member countries. In this case the positive sign on NTB may reflect the increase in intra Community trade in these commodities which has occurred as a consequence of trade diversion.

Inclusion of H has a minimal effect on the degree of explanation provided by the model, and results in a reduction in the F statistic. The variable is positive but not significant at the 5% level. This result supports the hypothesis that restraints on trade in Heckscher-Ohlin industries act to balance the proportion rather than increase, or decrease, the amount of intra industry trade. Secon was not significant at the 10% level.

Overall, the results outlined in Table 5.10 provide little support for the theory of intra industry trade outlined in chapter 1. Whilst the tariff variables have the expected signs and are significant at the 1% and 5% levels, the coefficients on PD, a measure of product differentiation and the potential for intra industry trade, have the wrong signs and are intermittently significant. However, since SITC5 is also insignificant and the level of explanation provided by the model is relatively low, this may reflect poor specification rather than the inadequacy of the theory.

Finally, the impact of adjustment of the dependent variable on the estimates, and the significance of the non-tariff barrier variables and TAR, should also be noticed.

Conclusion

The level of explanation provided by the four models outlined above is relatively low. Whilst R^2 rises to .59 when ITPC₇₉ is used as the dependent variable, the highest R^2 achieved in any of the other equations is .37. These estimates are, however, comparable with other cross-section studies of intra industry trade⁷⁴. They reflect the problems of obtaining adequate proxies for the theoretical constructs which underlie the analysis.

The principal results which form the basis of the analysis are analysed under three headings:

1. Categorical aggregation. SITC5 was used as a measure of product heterogeneity within the three-digit SITC commodity groups. It was hypothesised that it would be positively related to the change in the amount, and the proportion, of intra industry trade if categorical aggregation was present within three-digit commodity groups⁷⁵. The results suggest that SITC5 is positively related to the change in the proportion of intra industry trade, but no significant relationship between SITC5 and the change in the amount of intra industry trade was observed.
2. Product differentiation. PD was used as a measure of product differentiation. It was hypothesised that it would be positively related to the change in the amount and the proportion of intra industry trade⁷⁶. The variable was positively and

74 See for example Caves, op. cit.; Loertscher and Wolter, op. cit.; Pagoulatos and Sorenson, op. cit.

75 See p.161.

76 See p.159.

significantly related to the change in the proportion of intra industry trade but had the wrong sign and was significant when regressed on the change in the amount of intra industry trade.

3. Restraints on trade. Two tariff variables were specified:

TAR, the height of UK-EC tariff barriers in 1970/71, and TD, the degree of tariff similarity in 1970/71. It was hypothesised that TAR would be positively related to the change in the amount of intra industry trade, but would not be related to the change in the proportion of intra industry trade⁷⁷.

A positive relationship between TD and the amount and proportion of intra industry trade was expected⁷⁸. The results supported all of these predictions.

Two non-tariff barrier variables were specified: H and NTB. H was a dummy variable with Heckscher-Ohlin industries set equal to one, and all other industries to zero. A positive relationship was expected between H and the change in the proportion of intra industry trade⁷⁹. The results supported this prediction when the corrected change in the proportion of intra industry trade was used as the dependent variable. NTB was derived from a set of data generated by Page. Those industries in which NTBs were high were given a value of one, and all other industries were made equal to zero. Since the variable principally reflects external non-tariff barriers,

77 See p.151.

78 See p.153.

79 See p.155.

erected since the enlargement of the EC, a positive relationship between NTB and the change in the amount of intra industry trade was expected⁸⁰. This prediction was supported by the evidence in the case where the change in the amount of intra industry trade was used as the dependent variable.

Overall, the results provide a substantial body of support for the model outlined in chapter 1.

80 See p.154.

CONCLUSION

In this study the impact of UK entry into the EC on the pattern of UK trade with the EC(6) has been investigated in the context of two models: the first derived from the theory of customs unions, and the second from the theory of intra industry trade.

The results presented in chapter 4 provide little support for the explanatory power of the traditional theory of customs unions. The change in the penetration of EC(6) markets by UK manufacturing industry after UK entry into the EC could not be explained by inter industry differences in revealed comparative advantage and tariff levels. Revealed comparative advantage was significant, but had the wrong sign, and the tariff variable was not significant at the 5% level in any of the estimated equations presented.

Whilst the poor performance of the model may reflect the difficulty attached to the satisfactory specification of the estimated equation, the results do suggest that UK entry into the EC has not resulted in an increase in inter industry specialisation in line with the pattern of comparative advantage in the pre-entry period.

The result is supported by the aggregate estimates of the change in intra industry trade between the UK and the EC(6) presented in chapter 5. The aggregate estimates suggest that the proportion of intra industry trade in the total trade in manufactured goods between the UK and the EC(6) remained roughly constant during the post-entry period¹. This implies that UK entry into the EC did not result in an increase in inter industry specialisation.

¹ See chapter 5, p.144.

This result can be contrasted with the increase in the proportion of intra industry trade in the total trade in manufactured goods between the original members of the EC, which was observed by Balassa², Grubel and Lloyd³, Grubel⁴, and Sazanami and Hamuguchi⁵, and attributed to EC formation. The absence of any increase in the proportion of intra industry trade in the total trade in manufactured goods between the UK and the EC(6) after enlargement may reflect the already high proportion of intra industry trade in the total trade in manufactured goods between the UK and the EC(6) before enlargement⁶.

The aggregate results do, however, suggest that UK entry into the EC has resulted in a substantial increase in the amount of intra industry trade between the UK and the EC(6). Thus whilst the aggregate studies reviewed in chapter 2 have highlighted the growth in trade in manufactured goods between the UK and the EC(6) which has occurred during the post-enlargement period⁷, the results in this study suggest that 76% of this increase can be accounted for by intra, rather than inter, industry trade⁸, since the proportion of intra industry trade has remained constant.

To some extent, this increase in intra industry trade may reflect

2 Balassa, B. 'Tariff Reductions and Trade in Manufactures Among the Industrialised Countries', American Economic Review, Vol. 56, June 1966, pp.466-78.

3 Grubel, H.G. and Lloyd, P.J. Intra Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Macmillan, 1975.

4 Grubel, H.G. 'Intra Industry Specialization and the Pattern of Trade', Canadian Journal of Economics and Political Science, Vol. 33, August 1967, pp.374-88.

5 Sazanami, Y. and Hamuguchi, N. 'Intra-Industry Trade in the EEC, 1962-1972', Keio Economic Studies, Vol. XV, pt 2, 1978, pp.53-68.

6 See chapter 5, p.144.

7 See chapter 2, pp.32-51.

8 See chapter 5, p.141.

the presence of categorical aggregation rather than an increase in intra industry trade⁹. However, the results presented in the final section of chapter 5 provide some support for the theory of intra industry trade outlined in chapter 1.

Whilst the proportion of intra industry trade was partly determined by the degree of categorical aggregation, this variable was not significantly related to changes in either the amount or proportion of intra industry trade¹⁰. This implies that the increase in the amount of intra industry trade, noted above, cannot be explained by the presence of categorical aggregation.

As expected, the degree of product differentiation was positively and significantly related to both the proportion, and the change in the proportion, of intra industry trade¹¹. However, there was no evidence to suggest that the change in the amount of intra industry trade was positively related to the degree of product differentiation¹².

The tariff variables had the expected signs and were generally significant at the 5% level or better. TD, the degree of tariff similarity in 1970/71, was positively related to the change in the proportion and the amount of intra industry trade¹³. TAR, the height of UK-EC tariff barriers in 1970/71, was positively and significantly related to the change in the amount of intra industry trade¹⁴, but was

9 See chapter 2, pp.60-63.

10 See chapter 5, p.179.

11 See chapter 5, p.179.

12 See chapter 5, p.180.

13 See chapter 5, p.180

14 See chapter 5, p.180.

not related to the change in the proportion of intra industry trade¹⁵. Thus, as predicted¹⁶, a cut in the level of tariffs results in an increase in the amount, rather than the proportion, of intra industry trade.

The results also highlight the impact of non-tariff barriers on the pattern of UK trade with the EC(6) during the post-entry period. Whilst the NTB dummy variable was positively related to the change in the penetration of EC(6) import markets by UK manufacturing industry¹⁷, NTB was not significantly related to the normalised version of the dependent variable¹⁸. However, the non-tariff barrier dummy variables were positively and significantly related to the change in the proportion and amount of intra industry trade between the UK and the EC(6) after enlargement¹⁹.

H, a dummy variable which distinguishes between Heckscher-Ohlin and product cycle industries, was positively and significantly related to the proportion, and change in proportion, of intra industry trade, after adjustment²⁰. This result provides some support for the contention, of Hufbauer and Chilas, that NTBs are designed to encourage and maintain balanced trade in Heckscher-Ohlin industries.

The second non-tariff barrier dummy variable, NTB, was positively related to the change in the amount of intra industry trade, after adjustment. Since the specification of this variable does not

15 See chapter 5, p.180

16 See chapter 5, pp.151-153.

17 See chapter 4, p.126.

18 See chapter 4, p.126.

19 See chapter 5, p.180.

20 See chapter 5, p.180.

distinguish between internal and external non-tariff barriers, it was argued, in chapter 5²¹, that the positive sign on this variable reflects an increase in intra industry trade between the UK and the EC(6) within markets which are protected by external non-tariff barriers.

Overall, the results of the two models cast doubt on the ability of the traditional theory of customs unions to explain the impact of UK entry into the EC on the pattern of UK trade. The analysis suggests that the entry of the UK into the EC has not resulted in the relocation of productive capacity in the lowest cost centres of production, in line with the pattern of comparative advantage.

UK entry into the EC has, however, resulted in an increase in the amount of intra industry trade. This may imply that the benefits of UK entry into the EC have taken the form of an increase in choice through the trade in differentiated products, and an increase in productive efficiency through the economies of batch and long production runs which underlie intra industry trade. However, the results in chapter 5 suggest that some proportion of the increase in intra industry trade can be explained by the incidence of non-tariff barriers. Thus in Heckscher Ohlin industries the process of inter industry specialisation after UK entry may have been discouraged, and intra industry trade encouraged, by the erection of intra EC non-tariff barriers. Similarly the increase in the amount of intra industry trade may reflect the erection and maintenance of external non-tariff barriers, rather than the reduction in intra EC tariff barriers.

²¹ See chapter 5, p.154.

These results suggest three areas for future research:

1. The results highlight the substantial increase in intra industry trade which has occurred during the post-entry period. However, whilst PD, the proxy for product differentiation, was included in the estimated equation, the relative importance of the sources of product differentiation were not investigated because of problems attached to the reconciliation of the trade and industry nomenclatures²².

This omission raises two questions which are worthy of further study. Firstly, to what extent is the observed increase in intra industry trade based on advertising as opposed to the economies of batch and long production runs, or product-specific advantages founded in R & D and patent rights? Secondly, to what extent does it reflect a growth in the trade in intermediate, as opposed to final, products?

2. The results suggest that both the proportion, and the amount, of intra industry trade are positively related to the incidence of non-tariff barriers within the EC. However, the analysis in this study is based on a set of qualitative data developed by Page, and a dummy variable which distinguishes between industry types. It is not possible, on the basis of this data, to distinguish between internal and external non-tariff barriers. The observed results represent, therefore, the net effect of internal and external non-tariff barriers to entry. In the light of the observed significance of these

²² See chapter 3, pp.78-79.

variables and the growth in non-tariff barriers observed by Page, a case can clearly be made for the further investigation of the relationship between non-tariff barriers and the growth in intra industry trade within the EC. This study should focus on the relative impact of internal and external non-tariff barriers.

3. In this study the change in the pattern of UK trade with the EC(6) is explained in the context of the traditional theory of customs unions and the theory of intra industry trade. However, the impact of UK entry into the EC on the pattern of international investment and intra firm trade has been omitted from the analysis.

The change in the pattern of international investment, or intra firm trade, may, of course, reinforce the process of inter and intra industry specialisation predicted by the traditional theory of customs unions and the theory of intra industry trade. However, Helleiner²³ has pointed out that whilst intra firm trade accounts for a substantial proportion of total trade²⁴, there is no correlation between the incidence of intra firm and intra industry trade²⁵.

23 Helleiner, G.K. 'Transnational Corporations and Trade Structure: The Role of Intra Firm Trade' in Giersch, H. On the Economics of Intra Industry Trade, Tübingen, 1979, pp.159-81.

24 Helleiner estimated that intra firm trade accounted for 30% of total UK exports in 1973. Helleiner's results for the US suggest that the proportion of intra firm trade in the total trade in manufactured goods between the developed countries may be substantially higher. Thus intra firm trade accounted for 48.4% of total US imports in 1977 but 61.1% of total US imports of manufactured products from developed countries. Helleiner, op. cit.

25 At the three-digit SITC level for 1967.

This implies that different factors may underlie intra firm and intra industry trade, and suggests that the analysis could usefully be extended by the development and estimation of a model which explains the impact of UK entry into the EC on the pattern of intra firm trade between the UK and the EC(6).

Appendix 1

Appendix 1

The Penetration of EC(6) Import Markets by UK Manufacturing Industry¹.
 Industry Estimates⁴

Commodity Group	SITC	SITC	EC(6)M _{UK1}	EC(6)M _{UK1}	PIEC ²
	1st	2nd			
	Revision	Revision	EC(6)M _{W1}	EC(6)M _{W1}	
			1970/71	1978/79	
Organic chemicals	512	511			
		512			
		513	8.35	11.49	37.63
		514			
		515			
Inorganic chemicals, elements etc.	513	516			
		522	3.40	4.23	24.50
Other inorganic chemicals	514	523	3.68	6.63	72.71
Radioactive and as- sociated materials	515	524			
Synthetic organic dyestuffs etc.	531	531	9.10	10.73	17.81
Dyeing and tanning extracts	532	532	4.73	5.22	10.22
Pigments, paints, varnishes	533	533	8.35	8.44	1.09
Medical and pharma- ceutical products	541	541	10.91	10.01	-8.23
Essential oils, per- fume, flavour materials	551	551	6.57	7.95	21.16
Perfumery and cos- metics	553	553	10.20	16.04	57.31
Soaps, cleansing, polishing prepar- ations	554	554	4.08	7.05	72.80
Manufactured ferti- lisers	561	562	0.32	1.99	518.37
Explosives and pyro- technic products	571	572	Data unavailable		
Cellulose and arti- ficial resins	581	582			
		583	3.85	5.58	45.16
		584			
		585			
Chemical materials & products NES	599	591			
		592	6.53	8.63	32.13
		598			
Leather	611	611	5.19	4.75	-8.57
Manufactures of leather	612	612	1.91	4.19	119.78

Commodity Group	SITC 1st Revision	SITC 2nd Revision	$\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}}$ 1970/71	$\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}}$ 1978/79	PIEC
Fur skins .	613	613	10.54	11.89	12.85
Materials of rubber	621	621	10.54	9.71	-7.89
Articles of rubber	629	[625 628	7.36	8.48	15.22
Veneers, plywood boards etc.	631	634	0.59	1.36	129.10
Wood manufactures	632	635	2.91	3.92	34.58
Cork manufactures	633	633	2.48	1.67	-32.69
Paper & paperboard	641	641	2.33	3.48	48.98
Articles of paper, pulp or paper- board	642	642	4.57	5.21	14.03
Textile yarn or thread	651	651	3.53	6.11	73.28
Cotton fabrics, woven	652	652	1.27	2.42	91.27
Other textile fabrics, woven	653	[653 654 655	4.25	5.18	21.64
Tulle, lace, embroid- ery etc.	654	656	3.06	3.84	25.40
Special textile fabrics	655	657	4.10	5.79	41.25
Made-up textile articles	656	658	3.26	4.29	31.53
Floor coverings, tapestries etc.	657	659	2.77	4.21	52.26
Lime, cement, build- ing materials	661	661	1.49	1.27	-14.87
Clay construction materials	662	662	3.25	3.01	-7.60
Mineral manufactures NES	663	663	11.11	8.38	-24.61
Glass	664	664	4.32	5.94	37.50
Glassware	665	665	3.61	3.14	-12.96
Pottery	666	666	9.30	12.56	35.13
Pearls, precious and semi-precious stones	667	667	37.23	33.75	-9.34
Pig iron, sponge iron, ferro alloys etc.	671	671	1.11	2.73	144.74
Ingots and other primary forms	672	672	0.99	2.56	158.08
Bars, rods, angles, shapes	673	673	1.96	4.81	145.83
Universals, plates and sheets	674	674	1.76	3.73	112.10
Hoops and strips	675	675	1.00	2.38	137.86
Rails, and track con- struction materials	676	676	14.10	2.73	-80.67

Commodity Group	SITC	SITC	EC(6)M _{UKi}	EC(6)M _{UKi}	PIEC
	1st	2nd			
	Revision	Revision	EC(6)M _{Wi}	EC(6)M _{Wi}	
			1970/71	1978/79	
Wire, excluding wire rods	677	677	2.27	1.97	-13.54
Tubes, pipes & fittings	678	678	4.62	4.66	0.80
Castings & forgings unworked	679	679	4.00	3.32	-16.78
Silver platinum	681	681	19.14	26.58	38.93
Copper	682	682	3.25	2.74	-15.57
Nickel	683	683	18.71	16.65	-10.99
Aluminium	684	684	1.83	7.22	295.00
Lead	685	685	21.72	17.59	-19.03
Zinc	686	686	0.54	1.84	238.60
Tin	687	687	8.14	3.75	-53.90
Uranium, thorium & their alloys	688	688	Data unavailable		
Miscellaneous non-ferrous metals	689	689	2.39	5.30	122.08
Finished structural parts & structures	691	691	4.60	7.30	58.89
Metal containers for storage transport	692	692	5.77	10.07	74.58
Wire products & fencing grills	693	693	2.87	2.88	0.01
Nails, screws, nuts, bolts, rivets	694	694	7.75	6.58	-15.05
Tools for hand or machine	695	695	8.56	6.28	-26.64
Cutlery	696	696	4.73	6.64	40.52
Household equipment	697	697	3.11	2.89	-7.02
Metal manufactures NES	698	699	7.68	7.40	-3.68
Power generating machinery	711	711	17.17	14.58	-15.07
		712			
		713			
		714			
Agricultural machinery	712	718	7.24	8.73	20.72
		721			
Office machinery	714	722	15.24	14.47	-5.03
		751			
		752			
Metal-working machinery	715	759	9.05	6.04	-33.26
		736			
Textile & leather machinery	717	737	11.03	7.63	-30.80
		724			
Machines for special industries	718	723	9.99	9.20	-7.95
		725			
		726			
		727			
		728			

Commodity Group	SITC 1st Revision	SITC 2nd Revision	EC(6)M _{UKi}	EC(6)M _{UKi}	PIEC
			EC(6)M _{Wi}	EC(6)M _{Wi}	
			1970/71	1978/79	
Machinery & appliances NES	719	741			
		742			
		743	8.72	8.90	2.13
		744			
		745			
Electric power machinery switch gear	722	749			
		716			
		771	5.52	6.07	9.90
Equipment for distributing electricity	723	772			
		773	4.45	6.03	35.46
Telecommunications apparatus	724	761			
		762	4.21	4.31	2.33
		763			
Domestic electrical equipment	725	764			
		775	3.16	4.72	49.24
Electrical apparatus for medical purposes	726	774	3.08	4.30	39.55
Other electrical machinery & apparatus	729	776	7.32	6.78	-7.31
		778			
Railway vehicles	731	791	1.37	2.93	113.87
Road motor vehicles	732	781			
		782	5.46	5.55	1.63
		783			
		784			
Road vehicles, non-motor	733	785			
		786	14.61	13.34	-8.64
Aircraft	734	792	7.85	13.41	70.09
Ships & boats	735	793	6.32	12.91	104.34
Sanitary, plumbing, heating & lighting features	812	812	1.99	2.47	24.25
Furniture	821	821	2.97	3.55	19.61
Travel goods, handbags etc.	831	831	1.76	1.69	-3.79
Footwear	851	851	0.77	1.30	68.99
Scientific, medical, optical, instruments	861	871			
		872			
		873	12.71	9.56	-24.81
		874			
		881			
Photographic supplies	862	884			
		882	4.75	11.14	134.61

Commodity Group	SITC	SITC	$\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}}$	$\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}}$	PIEC
	1st	2nd			
	Revision	Revision	1970/71	1978/79	
Developed cinema film	863	885	26.85	28.20	5.01
Watches & clocks	864		1.33	2.14	60.36
Musical instruments & recorders	891	898	4.18	8.67	107.12
Printed matter	892	892	5.46	7.33	34.31
Plastic articles	893	893	3.90	6.64	70.49
Prams, toys, sporting goods	894	894	8.83	8.86	0.31
Office & stationery supplies	895	895	6.08	8.10	33.21
Works of art, collectors' pieces	896	896	27.00	32.68	21.04
Jewellery, goldsmiths' wares	897	897	1.50	4.11	173.98
Manufactured articles NES	899	899	4.28	3.28	-23.34

1 Source: Based on data obtained from Trade by Commodities, Series C, OECD, various issues.

2 $PIEC = \left(\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}} \right) - \frac{1978/79}{1970/71}$

$\left(\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}} \right) / \left(\frac{EC(6)M_{UKi}}{EC(6)M_{Wi}} \right) \cdot 100$
1970/71 1970/71

where:

EC(6) = Belgium, France, Luxemburg, West Germany, Italy, Netherlands

UK = United Kingdom

W = World

i = commodity.

3 The data used in this study are classified according to the 1st revision (1963) of the SITC, rather than the 2nd revision (1977). Ideally the first and second revisions should have been reconciled at the five- or seven-digit levels of the SITC. This option was precluded by the size of the computational task involved. Three commodities could not be satisfactorily matched at the three-digit level of the SITC (SITC 1st revision - 521, 841 and 842). These commodities were, therefore, excluded from the analysis. In addition some of the other commodity groups could not be exactly matched (i.e. SITC 1st revision - 512, 722 and 724). The differences are not, however, large and these commodities have been included in the analysis.

- 4 The data collection task was substantial. The final trade matrix contained a full set of import and export data on the trade flows between the UK, the EC(6), and Canada, Japan and the USA. In addition, the trade between each of these countries, or groups of countries, and the world was recorded. Data were collected for the four years 1970, 1971, 1978 and 1979. In order to obtain the final version of the trade matrix the 154 three-digit commodity groups of the 2nd revision of the SITC has to be reclassified to the 102 three-digit SITC commodity groups of the 1st revision. Since the OECD trade data were not available on tape, these operations had to be carried out by hand.

Appendix 2

Appendix 2

The proportion and amount of intra industry trade will only be accurately measured if the theoretical concept which underlies the theory of intra industry trade corresponds to the commodity definition used in the analysis. If the commodity definition does not correspond to the theoretical concept, goods with a different mix of factor inputs may be included in the same commodity group. The measure of intra industry trade may then contain elements of both intra and inter industry trade. An increase in the proportion of intra industry trade may then reflect an increase in intra and/or inter industry specialisation¹.

In most of the applied literature the industry has been defined in terms of the three-digit SITC commodity group². As noted in chapter 2, the three-digit SITC commodity group does not correspond to the concept of an industry which underlies intra industry trade theory. The estimates of intra industry trade may, therefore, contain elements of both intra and inter industry trade.

In this appendix the impact of disaggregation on the proportion of intra industry trade is investigated within the context of trade between the UK and the EC(6) in textile and leather machinery (SITC 717).

The impact of disaggregation on the proportion of intra industry trade has been investigated in a number of earlier studies. Grubel

1 See chapter 2, pp.60-63 for a detailed discussion of these points.

2 See chapter 2, p.60.

and Lloyd³ investigated the impact of disaggregation on the proportion of intra industry using three-, five- and seven-digit Australian data for selected commodities. Gray⁴ has analysed the impact of disaggregation using one-, two-, three-, four- and five-digit West German and French data.

The textile and leather machinery industry was selected as it has the highest proportion of intra industry trade (at the three-digit level) of all industries in the sample (almost 100%). The industry was also the twelfth largest source of UK manufactured exports to the EC(6) in 1970/71⁵.

The proportion of intra industry trade in the total trade in textile and leather machinery between the UK and the EC(6) was calculated at the three-, four- and five-digit levels of the SITC, using the formula developed by Grubel and Lloyd⁶ (equation A2.1).

3 Grubel, H.G. and Lloyd, P.J. Intra Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, Macmillan, 1975.

4 Gray, P.H. 'Intra Industry Trade: The Effects of Different Levels of Data Aggregation' in Giersch, H. (ed.) On the Economics of Intra-Industry Trade: Symposium, Tübingen, 1978.

5 Based on data derived from OECD Trade by Commodities, Series C, Paris, 1970 and 1971.

6 Grubel and Lloyd, op. cit.

Equation A2.1

$$\bar{B}_i = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i)}$$

where:

X = exports

M = imports

i = 1, ... n

n = number of industries at the chosen level of
aggregation

The results are shown in Table A2.1.

Table A2.1 The Impact of Disaggregation on the Proportion of Intra Industry Trade in the Total Trade in Textile and Leather Machinery Between the UK and the EC(6)*

	Three-digit	Four-digit	Five-digit
1970/71	99.85	93.62	89.47
1978/79	85.10	85.10	85.10

*Source: Based on data from the Overseas Trade Statistics of the United Kingdom, HMSO, various issues.

The results suggest that intra industry trade in textile and leather machinery between the UK and the EC(6) cannot be wholly explained by the presence of categorical aggregation. Disaggregation to the five-digit level of the SITC results in a 10% fall in the proportion of intra industry trade in 1970/71, and leaves the proportion of intra industry trade unchanged in 1978/79.

Data could not be obtained at the seven-digit level of the SITC. However, data were available at the six-digit level of the NIMEXE. The proportion of intra industry trade in the total trade in textile and leather machinery between the UK and the EC(6) was, therefore, estimated. The results are presented in Table A2.2.

Table A2.2 The Proportion of Intra Industry Trade in the Total Trade in Textile and Leather Machinery Between the UK and the EC(6), Calculated at Different Levels of Aggregation*

	Three-digit	Four-digit	Six-digit
1972/73	69.19	67.13	52.42
1978/79	60.87	60.87	45.74

*Source: Based on data from the Eurostat Foreign Trade Analytical Tables, Vol. J, various issues.

Due to changes in the commodity classification, satisfactory data were not available for 1970/71. In addition the NIMEXE commodity groups cannot be directly matched with the SITC commodity groups. This implies that the results outlined in Tables A2.1 and A2.2 are not directly comparable. The results do, however, provide further support for the contention that intra industry trade cannot be wholly explained by categorical aggregation. Over 45% of the total trade in textile and leather machinery between the UK and the EC(6) can be explained by intra industry trade at the six-digit level of the NIMEXE.

The individual four- and five-digit SITC estimates of the proportion of intra industry trade in the total trade in textile machinery between the UK and the EC(6), the world and the world less the EC(6) - R/W - are shown in Table A2.3.

The estimates in Table A2.3 emphasise the importance of intra industry trade as a proportion of total trade, in the textile machinery industry. Intra industry trade accounted for 57.63% of total trade in textile machinery between the UK and the world in 1970/71.

Table A2.3 The Proportion of Intra Industry Trade* in the Trade in Textile Machinery Between the UK and Selected Groups of Countries

	SITC		1970/71	1978/79
Textile machinery	717.1	World	57.63	75.21
		EC(6)	96.36	89.49
		R/W	40.79	48.98
Spinning machinery	717.11	World	43.87	49.99
		EC(6)	81.01	84.73
		R/W	31.67	22.22
Weaving and knitting machinery	717.12	World	60.07	88.88
		EC(6)	99.87	93.11
		R/W	41.09	73.78
Auxiliary machinery for weaving and knitting	717.13	World	55.33	81.94
		EC(6)	93.57	96.69
		R/W	38.09	68.08
Felt machinery	717.14	World	27.30	74.77
		EC(6)	61.48	19.05
		R/W	18.32	52.48
Washing, drying, printing machinery	717.15	World	84.60	96.23
		EC(6)	84.44	88.43
		R/W	67.67	71.91

Source: Based on data from the Overseas Trade Statistics of the United Kingdom, HMSO, various issues.

The proportion of intra industry trade in the total trade in textile machinery with the EC(6) was considerably higher than that with the rest of the world - 96.36% and 40.79% respectively. This difference reinforces the view that different theories are required to explain the pattern of trade between advanced and developing countries, and between the advanced countries. Thus the relatively small proportion of intra

industry trade in the total trade in textile machinery between the UK and the rest of the world may reflect the comparative advantage possessed by the UK, relative to the developing and advanced developing countries, in high technology products.

The proportion of intra industry trade in the total trade in textile machinery between the UK and the EC(6) is, however, difficult to explain within the context of the traditional theory of comparative advantage. The estimated values for intra industry trade between the UK and the EC(6) are relatively high at both the four- and five-digit levels of the SITC.

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